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OPHTHALMIC REVIEW

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EDITED BY

J. B. LAWFORD	London
N. M. MACLEHOSE, M.B.	London
KARL GROSSMANN, M.D.	Liverpool
PRIESTLEY SMITH	Birmingham
JOHN B. STORY, M.B.	Dublin
EDWARD JACKSON, M.D.	Philadelphia

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MEDULLATED NERVE FIBRES OF THE HUMAN RETINA. MICROSCOPICAL EXAMINATION OF THREE EYES.

(FROM THE PATHOLOGICAL LABORATORY, ABERDEEN UNIVERSITY.)

By C. H. USHER, M.B.Cantab., F.R.C.S.Edin.
OPHTHALMIC SURGEON, ROYAL INFIRMARY, ABERDEEN.

AN account of the microscopical appearances of the retinæ of three cases which had been examined with the ophthalmoscope during life has recently been published by Manz[1] (Freiberg). In his paper reference is made to a case examined microscopically and ophthalmoscopically by Schmidt-Rimpler in 1874, and to the earlier cases described by Virchow and Recklinghausen, but in which no ophthalmoscopic examination was made.

Owing to the difficulty of obtaining human eyes with medullated nerve fibres of the retina for microscopical examination, and since the observations of Manz differed in some respects from the description of the very few previously recorded cases, I consider that a description of three more eyes containing medullated nerve fibres may be of interest.

To Dr. George Dean I am indebted for the drawing of figure 2, and for his advice and ever-ready assistance in the preparation of the sections.

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[1] *Arch. of Ophthalm.*, xxix., 3 and 4, page 221 (German edition).

The eyes were hardened in Müller's fluid, embedded in celloidin, and cut with a freezing microtome. The sections were stained by Pal's[1] method, with aniline blue and saffranine (Strœbe),[2] by Kultschitzky's[3] logwood and eosine stain, and by a double stain with Pal's method and alum carmine.

The first eye is from a man, aged 40, whom I examined with the ophthalmoscope a few weeks before his death, but the only notes made of the eyes at that time are: "Ophthalmoscopic examination: right and left eyes, refraction estimated + 3D., a well-marked bundle of opaque nerve fibres radiating from the upper margin of each optic disc. Fundi otherwise normal." He had not complained of his vision, and as far as I recollect, he died from phthisis pulmonalis; only one eye was removed. The globe was opened equatorially and sections of the posterior half of it were made in an antero-posterior vertical direction. The anterior part of the eye appeared to be quite normal; it was not examined microscopically.

The microscopical examination of the sections stained by Pal's method gives the following appearances with a low power (fig. 1).

(1) The blue staining of the optic nerve fibres comes to an abrupt termination at the posterior part of the lamina cribrosa.

(2) No stained fibres can be traced through the lamina cribrosa.

(3) An exceedingly well-defined blue area in the retinal nerve fibre layer begins on the optic disc near its upper edge and extends upwards; the broadest part of the area is at the edge of the optic disc; it gradually narrows towards the upper part of the retina, forming roughly a triangle with its apex pointing away from the optic disc. This stained area occupies the whole thickness of the nerve fibre

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[1] "The Microtomist's Vade Mecum," Lee, third edition, p. 365.

[2] "Pathological Histology," C. von Kahlden (English edition), p. 139.

[3] *Loc. cit.*, p. 147.

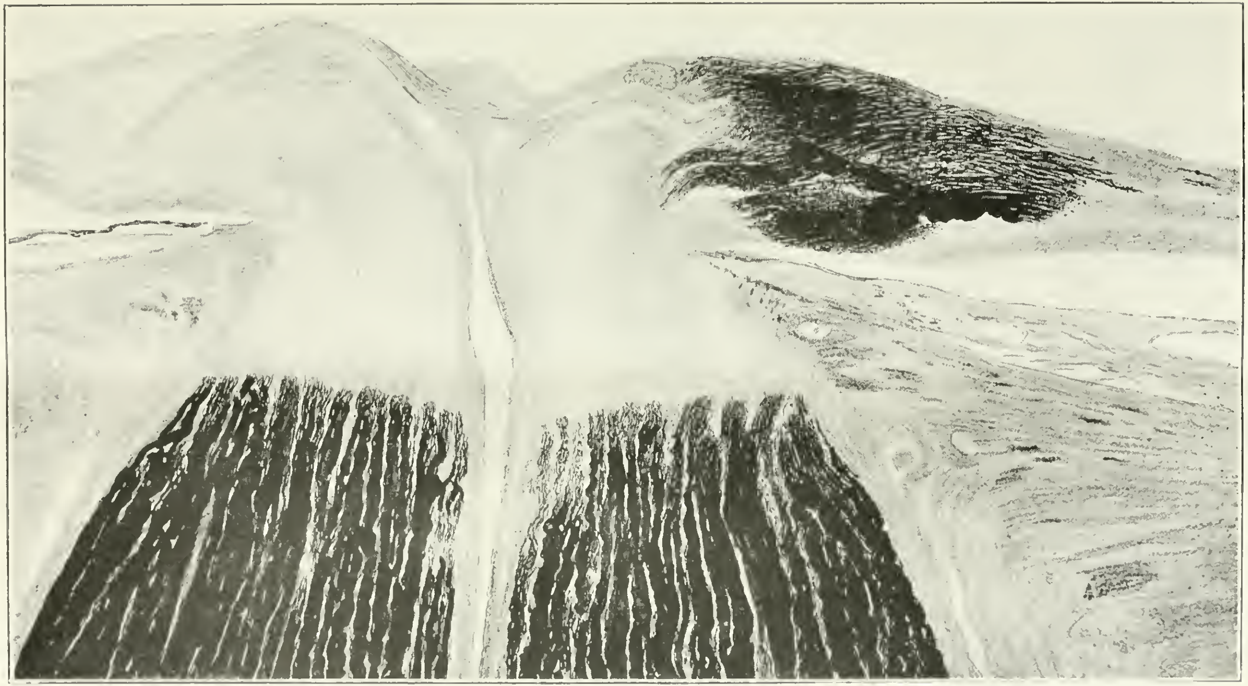

FIG. 1. A SECTION FROM THE FIRST CASE STAINED BY PAL'S METHOD, × 50.

It shows: the abrupt ending of the medullary sheath at the lamina cribrosa; the medullated nerve fibres in the retina extending upwards from the optic disc, and at first occupying the whole thickness of the nerve fibre layer; a few medullated nerve fibres isolated in the most dorsal part of the nerve fibre layer that is shown in the drawing; small swellings on the medullated nerve fibres in the retina.

layer at the optic disc ; towards the apex of the triangle the stained fibres are much fewer in number and lie at the posterior part of the nerve fibre layer.

(4) A few blue stained fibres are seen further away from the optic disc than the apex of the main area, being separated from the main area by a portion of the retina that is free from stained fibres ; these isolated fibres lie at various levels in the nerve fibre layer ; some are situated anteriorly, others posteriorly.

(5) Stained fibres are seen in the nerve fibre layer below the optic disc, in a few sections only ; these fibres are situated at a short distance from the optic disc and are

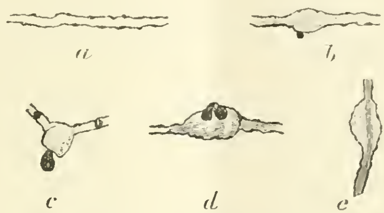

FIG. 2.—TYPES OF MEDULLATED NERVE FIBRES IN THE RETINA, DRAWN FROM A SECTION FROM THE FIRST CASE, STAINED BY PAL'S METHOD. (High power, Reichart, oc. 4, obj. no. 7a.)

(*a*) Small thickenings of the sheath are seen. (*b*) Spindle-shaped swelling (first form). (*c*) A common shape of first form of swelling. Projecting from its margin is a swelling of the second form. Two small swellings (second form) are seen of the fibre. (*d*) Swelling of the second form lying on a swelling of the first form. (*e*) A band apparently passes through the centre of this swelling.

very few in number. In sections made through the edge of the opaque patch only a very few stained fibres are seen ; they lie at various levels in the nerve fibre layer. In one section only two stained fibres are seen, and both are situated at a short distance from the optic disc.

(6) The stained fibres have small swellings on them. With a high power the minute structure of the stained fibres in the retina is seen to be as follows (fig. 2) :—Each stained fibre is composed of a homogeneous substance, and is lined by a thin, dark-coloured margin (*a*) ; the margin

is not of uniform thickness, but at very short and fairly regular intervals there are very minute thickenings on it. The swellings, which were seen by the low power, are now found to be of two forms: (1) A light-coloured homogeneous swelling, varying much in size and shape; some are spindle-shaped, and situated in the axis of the fibres (*b*); others are more rounded and bulge from the sides of the fibres; they measure from ·0050 to ·0200 mm. in diameter, and they have various but generally rounded shapes; here and there is seen a group of very small swellings similar to that just described. Each swelling is surrounded by a thin dark margin of the same thickness and presenting the same small thickenings as are seen on the nerve fibres. Some of the swellings are slightly lighter in colour than the fibres and in a few a band can be focussed in their centre (*e*). That the band occupies this situation is probable from the fact that with high magnification it is in focus at the same time as the dark margin of the swelling. This band is slightly darker than the swelling it appears to pass through, but is lighter than the margin of the swelling; it seems to be continuous at each end with the homogeneous central part of the nerve fibre that is connected with the swelling. There is a possibility that this band may, in some cases at least, be another nerve fibre lying under the swelling, but the absence of dark margins is contrary to this view.

(2) The second form of swelling is darkly stained and has great variety of shape and size, the largest measuring from ·0050 to ·025 mm. in length, the smallest being about the same size as the delicate thickenings on the margin of the nerve fibres. Many have a circular outline, others are irregular in shape. They are situated on the nerve fibres (*c*) and on the first form of swelling (*d*), or else they project from the margin of the nerve fibres or swellings (*c*). A few of this second form of swelling at first sight appear quite isolated, but in nearly every case on close focussing a fibre is found to lead up to them. In sections treated with aniline blue and saffranine (Strœbe) swellings are stained blue on the medullated nerve fibres, but are

apparently fewer in number than the swellings seen in the sections stained by Pal's method; they measure about ·0150 mm. in length, and ·0100 mm. in breadth, but vary in size; they are for the most part spindle-shaped. Stained with a double stain of alum carmine and Pal's stain, the appearance of the medullated fibres is very little different from that in sections stained by Pal's stain alone; the central part of the fibres and swellings remained unstained although left in alum carmine for twenty hours.

The second and third eyes are both from the case of a woman, aged 45, who died in the Aberdeen Royal Infirmary on March 15, 1895, from multiple malignant growths. A few days before admission she noticed the right upper lid drooping more than the left. She had no difficulty in vision. Jaundice developed one month before death.

I examined the eyes for Dr. Garden, to whom my thanks are due for permission to use the case, and noted the following:—January 28, 1895: right eye vision $\frac{6}{9}$ with + 2 D. cyl., axis horizontal; pupil $7\frac{1}{2}$ mm., no reaction to light or on accommodation. Divergent strabismus. No inward or upward movement of globe. Outward movement full. Very slight downward movement accompanied by rotation of globe, lower part of cornea turning outwards. Ptosis complete. Ophthalmoscopic examination: opaque nerve fibres extending from edge of optic disc.

Left eye vision $\frac{6}{9}$ with + 1 D. cyl. axis horizontal. Pupil small, reacts to light. Movements of globe full in every direction. Ophthalmoscopic examination (after homatropine): large patch of opaque nerve fibres extending up and in from optic disc, a small patch down and out. The fundi were otherwise normal.

The following abstract, from the notes of the *post-mortem* examination, Professor Hamilton has kindly allowed me to insert:—"There was wide-spread cancerous tumour disease of the lymph glands in the abdomen, chest and neck; the left lung was involved in the thoracic tumour, and the duodenum in that of the abdomen. There was no evidence of meningitis. The right third nerve was em-

bedded in a hard mass from the apex of the orbit to a quarter of an inch forwards in what appeared to be cancer tissue; this was evidently the cause of the ptosis; the remainder of the trunk of the nerve was free from cancerous or other disease. The second nerve was close to the mass, but not bound up in it."

The posterior halves of the two eyes were obtained, and microscopically the appearances correspond very closely with those of the eye of the first case.

In sections stained by Pal's method, the blue staining of the fibres in the optic nerves ceases abruptly at the lamina cribrosa, but in some sections fine, beaded, blue fibres can be seen passing through the lamina cribrosa. Blue stained fibres radiate in both directions from the optic disc, forming two triangular areas with their bases at the optic disc. The stained fibres at the apices of the two triangular areas lie in the posterior part of the nerve fibre layer. Near the optic disc the stained areas occupy the whole thickness of the nerve fibre layer of the retina. The retinal vessels near the optic disc are enclosed on all sides by the stained fibres. There are isolated stained fibres in the nerve fibre layer. The minute structure of the stained fibres presents appearances similar to those in the first eye.

The following conclusions may be drawn from an examination of my sections. The optic nerve fibres lose their medullary sheath at the posterior part of the lamina cribrosa, with the exception of a comparatively small number which retain their sheath as far as the retina. In the first case no medullated fibres were seen in the lamina cribrosa. Virchow found no medullary sheath in the lamina cribrosa, nor did Schmidt-Rimpler. Manz, on the other hand, found in his cases a medullary sheath on some of the nerve fibres in the lamina.

The opaque nerve fibres in the retina, therefore, are composed of nerve fibres which again become medullated at the optic disc, and of the few fibres which retain their myeline sheath in passing through the lamina cribrosa.

As regards the swellings on the medullated nerve fibres in the retina, the two forms evidently arise from different parts of the nerve fibres.

The second form, the dark homogeneous swellings, from the character of their staining, and from their situation, seem, without doubt, to be thickened parts of the medullary sheath.

The origin of the first form, the light homogeneous swellings, is not so clear. The medullary sheath, however, probably plays no important part in their formation, for it can be traced round the swellings unaltered in thickness and appearance. Their origin must, therefore, be from the axis cylinder, or from some substance between the axis cylinder and the medullary sheath. Manz found the varicosities on the opaque nerve fibres in his cases to be caused by swellings of the axis cylinder, and not of the myeline sheath. Blue stained swellings on the medullated fibres in sections stained with aniline blue and saffranine, indicate that the axis cylinder gives rise to them, but at most, only a few of the swellings in my sections stained by that method have the large globular appearance seen in sections stained by Pal's method. On account of this and of the appearances in some of the light swellings described above, I do not feel satisfied that all, if indeed any, of the light homogeneous swellings owe their origin to a swelling of the axis cylinder. Local accumulations of fluid between the axis cylinder and medullary sheath is the cause of varicosities in the varicose nerve fibres found in the brain and spinal cord (Klein[1]). No medullated fibres were seen during life with the ophthalmoscope, except those that radiated from the margin of the optic disc. There were no isolated patches, and from the examination of my sections, I think that there is no evidence that any of the fibres become medullated,

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[1] "Elements of Histology," fourth edition, p. 110.

except those whose sheath extends from the optic disc. It seems likely that the fibres which microscopically show a medullary sheath only at a distance from the optic disc, *e.g.*, those seen in the lower part of retina in the first case, and those seen isolated in fig. 1 (in both cases few in number), are fibres whose sheath extends from the optic disc, but owing to their obliquity the whole of the fibre is not seen in one section, and therefore cannot be traced to the optic disc.

SUPERNUMERARY CARUNCULA LACRYMALIS.

By Sydney Stephenson, M.B., F.R.C.S.Edin.

Ophthalmic Surgeon to the North-Eastern Hospital for Children; Surgeon to the Ophthalmic School, Hanwell, W.

Rose S——, aged 11 years, came to me with a small, reddish growth upon the conjunctival surface of the right lower lid. It was oval, about as large as a hemp seed, and its surface was granular. It lay immediately behind the inferior lacrymal papilla, and although situated near the caruncle, yet was not connected with that body. Its appearance, however, recalled that of the caruncle.

The girl was seen at intervals for six months, but no change was observed in the little tumour, which was ultimately snipped away on January 4, 1895.

When stained with hæmatoxylin and counterstained with eosin (or benzo-purpurine), the growth was found to consist of an epidermic and a dermic portion. The

former was made up of stratified epithelium ; the latter of connective tissue, which contained hair-follicles and sebaceous glands, striated and plain muscular fibres, together with groups of fat cells. The histological structure of the tumour agreed, therefore, with that of the normal caruncula lacrymalis. The conclusion follows that this was an instance of a supernumerary caruncle.

So far as I know, the foregoing case stands alone.

Before seeing Rose S——, I was unaware that the caruncle, like the tragus, mamma, or nipple, was subject to duplication.

TH. LEBER (Heidelberg). On Conjunctivitis Petrificans, an Unusual Affection of the Conjunctiva. *Report of the Heidelberg Ophthalmological Congress*, 1895.

This is a report of a case which Leber first saw in 1894, and which was quite new to him. He does not remember to have seen the same condition described, but acknowledges that he has not had time to search the literature thoroughly, and so may have overlooked records of cases somewhat similar.

The author prefaces his description of the case with the remark that he has, as yet, come to no satisfactory conclusion as regards the origin of the disease, although he has spent much time over the histological and chemical examination of excised portions of the affected conjunctiva. He reports in the meantime the essential points of his observations, with the hope of investigating the matter farther at a later date.

The patient was a young unmarried woman, aged 23. As a child she had had several suppurating glands in the neck, and has, for some years now, complained of a cough, with occasional blood streaks in the expectoration; she also suffered from endometritis. In other respects she was healthy, and the urine was normal.

The history of her eye condition was, that for three years she had been subject to attacks of inflammation in the eyes, and had been repeatedly treated for them. The character of the attack was always the same, affecting sometimes the right, sometimes the left eye. At first the inflammation subsided after a period varying from eight to fourteen days, and left no trace of its presence, but latterly the duration of the attacks was a good deal increased, and a partial symblepharon had formed in the left eye as a result of the disease. When admitted under Leber's care the left eye was severely inflamed, and the right was also affected, but less seriously. The eyes had been in this condition for two months, without having undergone any apparent change.

The essential feature of the condition, as Leber describes it, is that as a result of inflammatory swelling of some part of the conjunctiva, white opaque patches are formed which project little, if at all, above the conjunctival surface, and consist not of a superadded fibrinous layer, but of an alteration of the conjunctiva itself. They begin as small, often irregular spots, which, owing to their chalky look, contrast strongly with the injected surrounding tissue. They may first appear in any part of the conjunctiva, and gradually invade the tissues, both ocular and palpebral, until a wide irregular area is affected. The parts of the conjunctiva not directly involved show only moderate injection, and the discharge is slight. As extension of the disease goes on, the deeper parts of the conjunctiva also become affected, and the chalky patches at the same time get more intensely white, until finally the appearance is that of a perfectly dry, stony hard mass, with an irregular surface from which small uneven fragments may often be detached without difficulty. The patch itself, however, cannot be

picked away in this manner, but is firmly adherent, and can only be removed by scissors or the knife.

In Leber's patient the lower and inner part of the ocular conjunctiva, extending from the caruncle almost up to the corneal margin, and a portion also of the lower palpebral conjunctiva, were involved. The intermarginal portion of the upper lid was, too, the seat of a small patch of the same nature. The cornea, in the immediate neighbourhood of the larger mass, showed an ill-defined thickening of its epithelium, and there were also a few posterior synechiæ. The above description applies to the left eye only ; in the right eye there were a few points similarly, if less severely, involved.

It occurred to the author that the disease might possibly owe its origin to intentional injury on the part of the patient, but after the fullest investigation he has convinced himself that this theory is an untenable one. The likelihood of its being of a more or less infectious nature was evidenced by the fact, that repeatedly a part of the conjunctiva, or tarsal margin, which had previously been healthy, but which lay near an affected area, became in its turn covered with small spots.

Treatment was confined to the removal from time to time of such portions of hard masses as were separating, the use of warm applications and the instillation of weak sublimate solution. Caustics were carefully avoided throughout, *i.e.*, not only while the girl was under Leber's care, but also during the three years that she had been treated before she was sent to him. It should be added that on several occasions pieces of the affected conjunctiva were excised, but this was done more with a view to accurate diagnosis, by carefully examining them, than with any hope of direct treatment.

Leber draws attention to the way in which healing occurred as a feature of the disease worth noting. Either spontaneously, or after only very simple treatment, the less seriously involved parts of the conjunctiva healed without leaving any trace of the malady, while over the areas where the process had advanced further there remained

indeed a localised shrinking and thickening of the conjunctiva, but considering the severity of the previous affection this was very slightly marked. Four weeks after admission to Leber's clinic both eyes had completely healed, and they remained well for two months or so. Then a relapse occurred in both eyes and was carefully watched. In the left eye the places previously affected were again attacked, while in the right the disease was confined to a single patch, measuring 6 or 7 mm. across, which was situated on the inner half of the lower tarsal fold. Once more healing occurred quickly, so that after fourteen days there was little sign of the former ailment.

The history of the patient does not go farther than this point.

In his investigation as to the exact nature of this process Leber failed to detect anything to suggest that it was of parasitic origin: tubercle bacilli were also sought for in vain. Cultivations with agar and gelatine proved sterile, and inoculations—tried on two occasions—into the anterior chamber of a rabbit had no effect.

The incrustations of white opaque material were clearly proved to contain chalk, but differed from ordinary calcareous degeneration in that the opaque masses cleared up and seemed to dissolve on the addition either of acids or alkalies. The author has examined certain organic substances which behave in the same way, in the hope of elucidating the point, but not successfully, and can only come to the provisional conclusion that the chalk in his case is in some way in close combination with organic matter, and so presents this peculiarity.

In parts this substance presented a uniform, almost homogeneous appearance, while elsewhere it showed spear-shaped crystals arranged in sheaves and rosettes. These crystals were particularly obvious after the addition of an alkali, and lay chiefly at the margin of the chalky area, close to the more healthy part of the conjunctiva. The ground substance was formed of altered conjunctival tissue. On its surface there were flaky masses, showing here and there many giant cell nuclei. The masses them-

selves gave chemical reactions which suggested the presence of amyloid matter. Running towards the healthy tissue there was a network of delicate branching fibres, the exact nature of which Leber has not, as yet, been able to determine. The peripheral parts of the chalky areas stained more deeply than those towards the centre.

At the end of his communication Leber adds a short note of a case which was sent to him by von Hippel, and which he thinks may probably be of the same nature as his own. The clinical history corresponds pretty closely to that of his patient, except that the process had advanced farther, and in histological details there are many points of resemblance, although it is only right to say that at the first glance our author thought the differences between the two cases so marked as necessarily to imply that they were of a different nature.

There are crystals in this case, too, some in the epithelium, some in the conjunctival tissue itself; those in the latter structure lie close to cells which are filled with opaque nuclei. The crystals and some of these nuclei are of a citron-yellow colour; the other nuclei are colourless. The addition of ammonia dissolves the crystals and removes the colour from the nuclei, without affecting the nuclei themselves. The conjunctiva showed marked thickening of the epithelium in von Hippel's case, while in Leber's it had in great part disappeared. There was no trace of the fibrillary structure present in the other case. Examination for micro-organisms gave a negative result with aniline dies, but Delafield's hæmatoxyline showed numerous bacilli. Leber adds, however, that he is by no means sure that the bacilli were not due to a *post-mortem* change, and thinks that their presence should not count for much. In this instance, also, the author can only assert that the condition was due to the presence of chalk in some organic combination, which he cannot meantime farther define.

N. M. ML.

O. STUELP (Strassburg). On the Position and Function of the individual Cell-groups of the Oculo-Motor Nucleus. *V. Graefe's Archives, xli-ii.*

This paper records an attempt to investigate once more the exact constitution, so to speak, of the oculo-motor nucleus, and to define, as accurately as may be, the relation of the individual cell-groups of which it is composed, to the nerve branches which supply the different eye muscles. There are four ways, says the author, of proceeding to this end.

(1) The stimulation by electricity of different parts of the nucleus, and careful observation of the resulting muscle contraction.

(2) The method adopted by Gudden, which consists in removing one or more of the ocular muscles, and after a time examining with the microscope the oculo-motor centre, in the hope of making out which group or groups of cells show a corresponding degeneration, or if the operation has been performed on very young animals, which groups have been arrested in their development.

(3) Microscopic examination of the nuclear region in cases of partial ocular palsy depending on a central lesion, the object being to discover the relation between the structural change found *post-mortem*, and the ocular paralysis observed during life.

(4) The clinical observation of nuclear paralysis.

The obvious objection to the first method is, that the nucleus is too small to allow of reliable results being obtained in this way. It is impossible to be sure that stimulation of one group of cells does not also excite others in the immediate neighbourhood. We therefore cannot by this means differentiate properly.

Gudden's method has also proved thoroughly unsatisfactory in the author's hands.

First of all, Gudden himself has admitted that the complete extirpation of one of the orbital muscles in a very young animal is almost impracticable, and we may therefore argue that any conclusions based on expected arrest

of development in the corresponding central cells, are hardly to be relied on. Again, the author made a most careful microscopic examination of the nuclear region in the case of a man whose right eye had been removed thirty-four years before death. He hoped after such a long interval to find atrophy of the cells supplying the internal muscles of the eye, and possibly also some degeneration in the cell-groups for the nerves of the external muscles of the globe, but complete integrity of those for the levator. According to Gudden's theory, this was what was to be expected. But out of 500 sections, 150 of which were stained according to the accepted methods, no alteration either in cell or nerve twigs was discernible. This result, as the author points out, corresponds to what has been observed in the case of other motor nerve centres after removal of the muscles which they supply, as, for example, in amputation of a limb.

The third mode of investigation, as described above, is, our author thinks, the one which is open to least objection and most likely to give reliable results, provided always that the paralysis of the ocular muscles has been accurately determined during life. This is the method which most authors who have interested themselves in the question, have adopted, but in the majority of instances the absence of really accurate details, as to the ocular palsy, has invalidated their results.

The general outcome of examinations conducted in this way makes it probable that the cells of the internal muscles are to be found in the anterior part, and those for the external in the upper part of the oculo-motor centre.

Stuelp's main investigation on the point has been conducted on the lines of the fourth way, viz., the clinical study of cases of nuclear palsy. He collected no fewer than 229 cases of this kind, many of them examples of palsy of single muscles, and by careful observation and by comparison one with another of the different groups of cases, and the order in which the paralysis extended from one muscle to another, he arrives at certain conclusions as to the probable arrangement of the central cell-groups,

which we give in brief abstract. We must refer those whom the question interests and who wish for more detailed information to the original paper, with its numerous lists of cases carefully tabulated and arranged.

Stuelp's arrangement of the cells is shortly as follows :— The cells for the branches supplying the ciliary muscle and sphincter iridis must be close together, and in the most anterior part of the nuclear region. Next to them is that for the branch to the levator, and the clinical evidence is all in favour of the conclusion that this centre must be clearly separated from those for the other external muscles. Stuelp cannot agree with Hensen and Völckers in placing it between the centres for the superior and inferior recti. Farther back are the nuclei for the rectus internus and rectus superior, that of the rectus internus lying nearer the middle line than the other. Still farther back come the cells for the branches to the inferior rectus and inferior oblique, the former nearer the mid line than the latter, and, therefore, almost directly behind the centre for the internal rectus.

This arrangement corresponds pretty closely with some of those previously published, notably that of Kahler and Pick, and with the conclusions on the point which Starr and Knies independently arrived at.

As a clinical study the author's paper is full of interest, and certainly deserves all praise for the spirit of pains-taking care over the minutest details in which the question is approached.

N. M. ML.

BIETTI. On the Distribution and Termination of the Nerve Fibres in the Choroid. *Annali di Ottalmol, fascic.* 3, 1895.

Bietti has made use of Golgi's method to confirm and extend the results arrived at by Retzius. The eyes of recently killed rabbits and chickens were immersed in bichromate-osmic mixture, and after a period of five days were transferred to a 1 per cent. solution of silver nitrate. He finds that the vessels are accompanied longitudinally by fasciculi of nerve fibres; each fasciculus consisting of from five to ten fibres. The longitudinal fasciculi are connected by transverse ones; from the latter are given off branches which, by subdivision and anastomosis with similar branches, form an intricate network about and in the vessel wall. In this network, and especially at the points of division, there are to be noted little round, oval, or fusiform swellings, varying in size from one to five mikrons. Instead of a transverse fasciculus, a single fibre may separate itself from the longitudinal bundle, and after a serpiginous course join another from the opposite side; or it may divide and sub-divide into fibrillæ which end in little bulbous swellings. These ramifications can be traced to the layer of smooth muscle fibres in the vessel wall, which would seem to show, what hitherto has been a matter of conjecture, that the nerves of the choroid are really vaso-motor nerves.

Besides this peri-vascular plexus, Bietti describes a plexus situated beneath and in close apposition with the pigment epithelium; this plexus, he believes, has not before been described. He is still engaged in investigating its exact relation to the epithelium.

W. WATSON GRIFFIN.

Piazza. Adenoma of the Lacrymal Gland. *Annali di Ottalmol, fascic.* 3, 1895.

Piazza asserts that there are not more than thirty cases of undoubted tumour of the lacrymal gland on record, and so takes occasion to add one which came under his own observation. The patient was a shoemaker, 40 years of age. A swelling had been noticed in the outer part of the left upper lid when he was under treatment for conjunctivitis ten years before; it was now about the size of an almond, and caused the lid to droop considerably. The swelling was elliptical in shape, with its larger end towards the external canthus, and measured in length about 38 mm.; its depth was 20 mm., while it projected beyond the plane of the orbit about 8 mm. The skin was freely movable over it, the surface of the tumour being smooth and even; there was no pulsation or bruit, and no sense of fluctuation. Pressure was slightly painful. The consistency of the tumour was that of a muscle in a state of semi-contraction. The globe was displaced downwards and forwards towards the nose, and its movements outwards and upwards were slightly defective. There was slight hyper-secretion of tears, at times diplopia, and a feeling of weight or of pain in the eye. Vision rather weaker in left eye than in right. There was no enlargement of the nearest lymphatic glands. The diagnosis of adenoma (the most common type of lacrymal tumour) was made before removal, and this was confirmed afterwards by microscopical examination. The extirpation of the tumour was a little difficult, in spite of a large skin incision, owing to its softness and the depth to which it extended, and the thinness of its capsule. Two years have elapsed since its removal, and there has been no complication or recrudescence. He remarks that when a lacrymal tumour is of such a size as to be a trouble to the patient, we may be sure that it extends to the back of the orbit, and its complete removal will be a matter of difficulty, especially if it is soft in consistency, and of a colour not easily distinguishable from surrounding tissues. And if it is not

all removed, the adenoma may grow again or become malignant. The sooner, therefore, such tumours are removed the better. Moreover, when a tumour has attained any size, the large skin incision that is required may bring about ptosis, as has happened in many cases. When the tumour is small, one may be able to deal with it by canthotomy and an incision through the upper fornix.

W. WATSON GRIFFIN.

O. HAAB (Zurich). An Atlas of Ophthalmoscopy, with an Introduction to the Use of the Ophthalmoscope. Translated and Edited by Ernest Clarke, M.D., B.S., F.R.C.S. London: Baillière, Tindall and Cox, 1895.

This little book fulfils, we think, very accurately the object of its publication. In a few words of preface, the translator expresses the hope that it may prove a useful guide to the student, and a help to the busy practitioner. This is just what the book will be, neither more nor less. It is in no sense an elaborate or classical atlas of ophthalmoscopy, but it represents, for the most part very faithfully, the various changes which occur in the fundus in the more common diseases of the eye. The trained oculist will learn nothing from it, but the student who is only beginning eye work, or the practitioner whose ophthalmoscopic memories are growing dimmer than he would wish, will find it a really useful little volume.

There are exactly a hundred coloured illustrations, set forth in sixty-four plates, and to each plate is appended a short description of the condition represented, so that the student may understand what he sees. Some of the drawings are very good, most of them are fair, and a few of

them are bad, but taken all round they are, for a book of this class, well up to the average. The translator also has done his work well.

We are inclined to take exception to the length of the introduction, some fifty-five pages in all, and to the questions which are treated in it. Surely such subjects as errors of refraction, the meaning and application of the shadow test, and the size of the ophthalmoscopic image might with advantage have been omitted from a little volume of this kind, which is in no possible sense a text book.

A few pages at the end of the introduction describing the ophthalmoscopic appearances of the normal fundus are obviously in place. They might with advantage, we think, have been allowed to stand alone.

This detail apart, we heartily recommend the volume to the students and practitioners for whose benefit it has been published.

H. Gradle (Chicago). The Palpebral Form of Spring Catarrh. *Archives of Ophthalmology*, *xxi v.*, *iv.*, *October*, 1895.

It is worth while to draw attention to this paper, because it treats of an ocular disease which is, perhaps, less generally recognised than it should be.

It is, of course, perfectly well known that spring catarrh sometimes attacks the palpebral conjunctiva only and leaves the circumcorneal area free. But cases of this nature are rare, and are, therefore, worthy of record.

The author begins his article with a short retrospect of the literature of the subject, which we may leave unnoticed, and refers to a paper of his own published in 1886, where

he gives the history of four cases in which the conjunctival lesion recurred every warm season in the upper lid, but without the characteristic circumcorneal lesion of spring catarrh. In that paper he pointed out the periodicity of the disease, and compared it with the course of hay fever, which it further resembled by rapidly improving when the patient moved to a cooler part of the country.

Since he reported these four cases he has seen eight more instances of the same disease, making twelve in all. In one only out of the twelve was there very slight circumcorneal tumefaction, consisting of three discrete nodules not larger than small phlyctenulæ. The other eleven showed no lesion anywhere except on the tarsal portion of the conjunctiva of the upper lid. In more than one instance an erroneous diagnosis of trachoma had previously been made by other oculists, and it is the hope of correcting the liability to this mistake that has mainly induced the author to bring his cases forward.

The complaints of the patients are often very pronounced. They begin with the onset of warm weather, and last till the end of September or October. (It must be remembered that the writer is speaking of the American climate.) One patient only of the twelve was not entirely free from annoyance last winter, and this was a case in which very marked hypertrophy had been present for two consecutive summers. Increase of temperature increases the discomfort, and a few cool days often give marked relief. The symptoms are the ordinary ones of photophobia, itching, burning smarting pain, with a good deal of lacrymation and some secretion, either stringy mucus or pus. In every instance both eyes were affected, although not always to the same extent.

The appearance of the affected conjunctiva depends greatly on the number of times the disease has recurred. We cannot do better than quote the author's own description. He says :—" In two instances the conjunctival surface was smooth and but slightly injected when the trouble began. There was nothing characteristic to be seen the first summer, but towards fall the surface became slightly

velvety in one of the patients. The next year the conjunctiva of the first patient presented the appearance of slight follicular conjunctivitis, while the second one had by this time marked papillary hypertrophy. In both patients the lesions became more pronounced the following season. Five other patients who were seen during the second season of their complaint showed changes varying between a fairly smooth but reddened surface with underlying minute follicles, to decided roughness due to papillary proliferation. The third or fourth year the hypertrophy, in the form of papillæ, sometimes distinctly pedunculated, reaches its full extent. Two patients seen during the thirteenth and twentieth yearly attack, had the same lesions that I had seen in others in the third or fourth year. From the second year the surface usually presents an opaque appearance—as most of the writers describe it, as if covered with a thin layer of milk. But this description does not apply in every instance. In the later years I have repeatedly seen the surface of a pale yellowish hue, with very slight vascularity."

In none of the twelve cases was the lower lid involved in the disease. The writer also notes that in no single instance did he observe the circular streak of corneal opacity like an early arcus senilis, which is described by some authors as characteristic of spring catarrh.

No clue to the etiology of the complaint was discovered in any of his patients. Four of the twelve had had one or two attacks in previous years of respiratory irritation, which had suggested hay fever, but none of them had suffered from annually recurring typical fever of this nature.

With a few words on treatment, to which we need not refer, as he has found nothing do better than the generally accepted methods, the author brings his paper to a conclusion.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

E. Nettleship, F.R.C.S., President, in the Chair.
Thursday, January 30, 1896.

The Visual Effects of Refractive Error.—Dr. Geo. J. Bull (Paris) read this paper. He gave an account of a series of experiments in which he had endeavoured to reproduce, with the photographic camera, the effects of the different degrees of myopia, hypermetropia, and astigmia. The effect of a given error of refraction upon the photographic appearance of the test types was different in certain characteristic respects from the image seen by the eye. By further investigation he had come to the conclusion that this difference was accounted for by the fact that there was in every case of refractive error an element of monocular diplopia, which he gave reasons for ascribing to the sectors of the crystalline lens. By adding to the photographic camera a lens which was itself divided into sectors he had been able to produce a photographic image of the test types closely analagous to the visual image with the corresponding error. A series of these photographs was presented at the meeting, and will appear in the *Transactions*.

The President remarked that monocular diplopia was not a common complaint of patients with refractive error; if the phenomenon were constantly present it should be more common.

Dr. Bull said it was always present, even in children, but most people did not observe carefully.

Uveal Cysts of the Iris.—This case was described by Messrs. Eales (Birmingham) and Sinclair (Ipswich). In a man, aged 47, the condition in the left eye was one of absolute glaucoma, the result of a chronic non-inflammatory glaucoma of some years' standing. Extending into the pupillary area from behind the iris were two dark brown globular masses. These moved freely with every movement of the eyeball, and on close examination with a magnifying glass fine jelly-like quivering of the surface of

each mass was noted. The diagnosis of cystic detachment of the posterior uveal layer of the iris was fully borne out by pathological examination. This was the first case, so far as the authors knew, in which cystic detachment of the uveal layer of the iris had been diagnosed clinically, though reference was made to other published cases in which this condition was probably present, and attention was drawn to the fine creasing and quivering of the cyst wall as a diagnostic sign between this condition and pedunculated sarcoma of the iris.

Mr. Treacher Collins said that Mr. Eales's case formed an excellent sequel to those he had previously published. It was quite common to find, pathologically, separation of the two pigment epithelial layers on the back of the iris in eyes which had had iritis ; the posterior becoming glued down to the lens and the anterior together with the stroma of the iris being displaced forwards. That the two layers should become separated apart from inflammation and give rise to a cystic tumour, as in Mr. Eales's and his cases, was very exceptional.

Optic Nerve Atrophy in Three Brothers.—Dr. F. M. Ogilvie read this paper. The brothers were aged 24, 22, and 27 ; in the first one the sight was said to have failed in one night, in the second in three months, in the third in six months. They had all been smokers, but one had given it up more than seven years before. In all of them there was a central scotoma ; in two there was defective colour vision ; in one only the visual fields for white were contracted. The ophthalmoscopic appearances were not very well marked ; in two of the brothers there was pallor of the disc, but the atrophy was not of a very high degree in any of them ; vision was much reduced. One of them had improved somewhat under strychnine and galvanic treatment. A peculiarity in the brothers which they shared with others in the family was the tortuosity of their retinal vessels. So far as the family history could be traced there were no others who had optic nerve atrophy. The father and mother had good sight ; the latter was one

of ten, there was no history of defective sight among her brothers and sisters. She had sixteen pregnancies, and fourteen children born alive; all the males, except the three who were the subject of this paper, had died in infancy.

Card Specimens.—The following were shown: Mr. Simeon Snell: Alveolar Carcinoma of Upper Eyelid. Mr. C. D. Marshall: (1) Removal of Metallic Chip from the Vitreous by the Electro-magnet; result eighteen months afterwards; (2) Cholesterine in the Anterior Chamber. Mr. W. Adams Frost: Peculiar Ring-Opacity of the Cornea. Messrs. Holthouse and Batten: Peculiar (? congenital) condition of Optic Disc in a case of Choroido-retinitis. Mr. Fischer: Extraction of lenses in Buphthalmos.

AMERICAN MEDICAL ASSOCIATION—SECTION OF OPHTHALMOLOGY.

Forty-Sixth Annual Meeting, held at Baltimore, 1895.

Edward Jackson, M.D., of Philadelphia, Chairman.

Strength of the Different Mydriatics and Myotics.—The Chairman took this for the subject of the annual address, reporting the results of observations of the effects of these drugs on the size and reactions of the pupil, and the power of accommodation in normal eyes. He found that these effects could be most accurately observed subjectively. Only one eye was subjected to the influence of the drug at a time, the other being kept normal for comparison, and control of illumination.

The diameter of the pupil was measured by the distance

between minute openings placed at the anterior focus of the eye, which gave tangent circles of illumination on the retina. The effect on accommodation was measured by the lens (convex for a mydriatic, and concave for a myotic), which caused the near point of the affected eye to correspond with the near point of the normal eye.

The minimum dose, usually capable of producing a perceptible effect on the pupil and accommodation, was ascertained by placing on the upper margin of the cornea a single drop, from a pipette giving 180 drops to the drachm, of a solution of the drug in distilled water.

The weakest solution producing a perceptible effect was found to be :—

Pilocarpin Hydrochlorate ...	1 : 2,000
Homatropin Hydrobromate	1 : 10,000
Eserin Sulphate	1 : 50,000
Atropin Sulphate	1 : 500,000
Hyoscyamin, or Duboisin Sulphate, or Scopolamine Hydrobromate...	1 : 1,000,000

Daturin had been found physiologically identical with duboisin and hyoscyamin.

As the minimum dose could be readily tested without inconvenience by the surgeon in his own person, it was hoped that the matter would receive more attention. In practical use, however, the doses employed are usually much greater, and in such doses it was found that the drugs which are the more evanescent in their action proved relatively stronger.

To determine the relative power of the different mydriatics when used in practical doses, they had been tested as to their power to neutralise the physiological effect of a solution of eserin sulphate, 1 : 1,000 ; and the relative power of pilocarpin had been tested by its power to neutralise the action of homatropin. Most sources of possible error had been eliminated by using a single solution containing both drugs in the desired proportions. By a series of such tests it was found that the relative strengths of the different mydriatics and myotics were expressed as follows,

in terms of the strength of the weakest (pilocarpin), as unit :—

Pilocarpin Hydrochlorate	1
Homatropin Hydrobromate	4
Eserin Sulphate	24
Atropin Sulphate	120
Hyoscyamine, or Duboisin Sulphate, or Scopolamin Hydrobromate	300

The myotics act more quickly and lose more quickly their influence over the pupil and accommodation than do the mydriatics. Hence in using such a double solution there is first produced a myosis, which later gives way to mydriasis. When, however, a mydriatic solution is used alone, or an eserin solution is used alone, there is a certain period of comparatively uniform maximum effect. These periods of maximum effect for eserin and the mydriatics overlap, except with atropine, the maximum effect of which is reached just after the effect of eserin has begun to decline. Complete neutralisation was sought during this overlapping of maximum effects.

Incipient Cataract.—Dr. A. R. Baker, of Cleveland, suggested that in all cases of this condition the urine should be examined chemically and microscopically, the general health carefully enquired into, all errors of refraction corrected, and a careful examination made of the ocular fundus. Appropriate treatment should be carried out, and if operative interference became necessary, it should be undertaken early, before the general health became impaired. A few carefully reported histories of cases from incipiency to maturity would be of more value than statistics of hundreds of successful operations. In a case of diabetic cataract, in which the sugar had almost disappeared from the urine under dietetic treatment, the vision improved from inability to count fingers to R. 20-70, and L. 20-60 ; and had continued sufficient, though varying with the amount of sugar in the urine, until death four and a-half years later. He had seen marked improvement in another case of diabetic cataract after prolonged

use of Carlsbad water with restricted diet. He believed there was also a nephritic cataract, and had seen improvement from 20-200 to 20-50 vision in such a case, corresponding with improvement in the renal secretion.

Operative Treatment of Immature and Zonular Cataract.—Dr. John E. Weeks, of New York, read a paper based upon twenty-five cases, of which five were zonular, three soft, one diabetic, twelve ordinary senile, and four complicated. There were no failures, the poorest vision obtained being 20-70, while thirteen gained vision 20-20 or better. In a majority of cases a part of the lens substance was left behind in the capsule and subsequently underwent absorption. A secondary operation was done in twelve cases, although some of these had good vision without it. Dr. Weeks had found that ripening operations, while they caused complete opacity did not facilitate the separation of the lens cortex from the capsule. The difficulty of removal is greater for immature than for mature cataract; but in the hands of expert operators the danger is but little more, and the results appear as favourable as those ordinarily obtained by removal at the stage of maturity.

Dr. Knapp had seen, some thirty years ago, the lens of a diabetic rather quickly become opaque and soon after clear up. For immature cataract he would make the first operation an extraction, preferring the risk of dealing with remnants by a secondary discission, to the double operation of ripening and extracting, which often requires a subsequent division to clear the pupil.

Dr. Hotz stated that his experience with ripening operations had been unfavourable. He found the extraction of immature cataract did not involve greater danger than the removal of fully mature cataract, if there were not present a very large amount of absolutely transparent lens matter.

Anæsthesia for Plastic Operations about the Eye.—Dr. M. W. Zimmerman, of Philadelphia, read a paper on this subject. Among general anæsthetics for these operations, ether was the best. The method of administration should be simple, cleanly, and avoid encroaching on the field of operation.

He depended on two layers of coarse soft towel; he was sure that many operative wounds had been infected by inhalers. Cocaine was the only suitable local anæsthetic, applied in 2 to 4 per cent. solution to the conjunctiva, or injected subcutaneously when the skin was involved. Used by the latter method, the punctures should be few; and to guard against serious or even fatal intoxication, the strength of the solution should not exceed 2 per cent. or the total amount of the drug more than 2 or 2·5 grains.

Transplantation of Skin to the Eyelid.—Dr. Walter B. Johnson, of Paterson, N.J., reported the case of a coloured boy, aged 3 years, with complete eversion of the upper lid and caries of the frontal bone, following injury. After proper treatment of the caries, the lid was dissected from the brow, all cicatricial bands divided and its margin stitched to the margin of the lower lid. The surface thus exposed was then covered by an elliptical piece of skin two inches long and one inch wide, transplanted from the inner side of the thigh. The relief from deformity was complete except that the lid could not be fully elevated.

Skin-grafting for Ectropion and Entropion.—Dr. F. C. Hotz, of Chicago, believed that we should not be satisfied with the mere removal of the ectropion, but should give back to the lid its normal shape and mobility. For this purpose Thiersch's skin-grafting operation he regarded as a valuable accession to plastic surgery. It solved the problem of repairing the eye-lids with a material possessing the important attributes of the lid skin—a soft light cover which snugly adapts itself to all lid movements. It gives results superior in every respect to those achieved by the transplantation of skin flaps. For ectropion of the upper lid, the lid margin is dissected free and all cicatricial bands divided. Three ligatures are passed through the lid border and fastened to the cheek by adhesive plaster; or, if the lower lid is also everted, the two lid borders are fastened together. This makes the surface to be covered with skin-grafts so large that the subsequent contraction will not spoil the result, and keeps the lid immovable while healing.

The grafts are taken from a portion of the arm, previously sterilized, being floated upon the razor in normal salt solution, and transferred directly to the previously prepared surface.

It is not necessary to cover the whole wound with a single graft ; but it is better to have the grafts few and large, than to have them many and small. The dressing consists of silk protective, cut in strips half an inch wide and long enough to lap over the edges of the wound, with a second similar layer of the protective, the direction of the strips being perpendicular to the first ; and over this is a compress kept wet with the salt solution. The other eye is also bandaged to secure rest. The first dressing should remain undisturbed for at least two days. The grafted skin gradually shrinks to about one-fourth of its area, but if due allowance has been made this need not affect the perfect cosmetic success of the operation.

For entropion permanent relief can be attained only by a reconstruction of the lid border. Dr. Hotz had formerly advocated an operation of grooving the cartilage, but had abandoned it, being convinced that the creation of a new lid border answers the purpose better, and is a less tedious operation. He splits the lid by the usual inter-marginal incision, deep enough to allow of free gaping ; then makes an incision through the skin and orbicularis along the upper border of the tarsal cartilage, and excises a strip of muscular fibres covering that border. Three sutures are passed through the edge of the lid skin then through the upper border of the cartilage and finally through the upper skin border of the upper wound. When these are drawn up the skin margin of the lid is elevated and the inter-marginal incision becomes a gaping wound to be filled with a skin graft. To fill this gap Dr. Hotz prefers a solid skin graft taken from behind the ear to the thin graft of Thiersch. It is pressed into place, with care that its surface shall not protrude beyond the edges of the wound. Should it protrude, he removes it and snips away enough of the cutis to sufficiently reduce its thickness, and then replaces it. He has had no trouble from hairs growing

from such a graft of true skin, and believes that when they do occur they come not from the graft but are cilia that have been left in the posterior flap of the original incision.

Operative Treatment of Severe Entropion.—Dr. Herman Knapp, of New York, finds the best method to be the implantation of skin into the inter-marginal space of the lid. The steps of the operation include, ordinary cantho-plasty, incision of the inter-marginal space, curved incision of the skin 3 or 4 mm. above the ciliary border, removal of a small strip of muscle along this incision, grooving of the tarsus, passing 4 or 5 sutures through the lower lip of the wound, the upper edge of the tarsus, and the skin of the upper lip; detaching from the upper lip of the wound with a straight pair of scissors a strip of skin 1·5 mm. broad and as long as the inter-marginal incision into which it is to be implanted; tying the skin-tarsus sutures, and implanting the skin in the gaping incision; finally dressing with greased bichloride gauze, or leaving the eye uncovered.

Epithelioma of the Eyelids.—Dr. Herbert Harlan, of Baltimore, had tried various procedures for the removal of malignant growths affecting the lids and their immediate vicinity, and found the best to be extirpation by the knife, and restoration of the lid by a plastic operation. He exhibited a case in which he had removed, two years previously, an epithelioma involving the lacrymal sac and canaliculi and the upper and lower lids. Two previous operations had been done upon it. Its removal left a wound 3 cm. in diameter, which was filled by a flap with a pedicle, taken from the forehead. There remained an ectropion.

Dr. R. A. Reeve, of Toronto, thought that after transplantation of a flap without pedicle it was important to maintain a union of the lids for a long time to diminish the ultimate shrinking of the flap. In one of his cases the lids were kept united for years, though sufficiently open to permit useful vision.

Evisceration of the Eyeball.—Dr. L. Webster Fox, Philadelphia, reported six cases in which he had performed

this operation, with insertion of the artificial vitreous spheres suggested by Mules. If performed under strict antiseptic precautions very little or no reaction followed. By it a better support was obtained for an artificial eye. In his first two operations there was reaction so great that he had deemed it prudent to subsequently remove the artificial vitreous and stump.

Dr. S. D. Risley found that, as compared with enucleation, Mules' operation gave better cosmetic results, and left the patient more comfortable, because the tears flow off in a natural way, and he is not troubled with the collection of muco-purulent discharge in the orbit behind the artificial eye.

Wound of the Eyeball. Micro-organisms.—Dr. G. E. de Schweinitz, of Philadelphia, reported three cases of traumatic irido-cyclitis in which the eyes were removed and subjected to careful histological and bacteriological study. In the first case there was sympathetic serous iritis, which recovered after removal of the exciting eye. The excised eye contained a foreign body, and there was slight papillitis and neuritis of the ciliary nerves, but no micro-organisms were found by microscopical examination of suitably stained sections. In the second case sympathetic uveitis had caused blindness. There was marked papillitis and also neuritis of the ciliary nerves. No micro-organisms were found by staining or culture methods. This patient suffered from headache, fever, delirium and emaciation, and his general condition greatly improved after the enucleation, but not the condition of the sympathising eye. In the third case the eye contained a piece of steel, and showed on the fourth day commencing purulent irido-cyclitis. Cultures, from various parts of it, all showed the presence of pus staphylococci.

He also reported a case of post-operative panophthalmitis, eviscerated at the twelfth day, in which, in addition to cocci, there was found a rod-like bacillus, uniform in size, slightly rounded at the ends, and staining easily with the anilin dyes, better with methyl blue. But experimental inoculations of the eyes of rabbits showed this bacillus to be non-pathogenic.

THE LIGHT PERCEPTIVE POWER AS AN AID TO DIAGNOSIS AND PROGNOSIS IN DISEASES OF THE EYE.

By R. WALLACE HENRY, M.D.Leicester.

THE light sense, or power of the retina or visual centre to perceive light pure and simple, as distinguished from form or colour, has only recently received anything like the study that such an important subject merits. Except in one branch of the question not very much progress has hitherto been made, partly because of the difficulty of comparing the results of each observer's work owing to the various instruments used, and partly because there was considerable confusion until it was found that the subject resolved itself into two parts: (1) the minimum amount of light perceived in each case; (2) the minimum difference in intensity between two sources of illumination detected in each case; or to give them the names by which they will be hereafter referred to, "the light perceptive power," and "the light difference power."

A brief summary of our knowledge concerning the light sense is given in Berry's "Subjective Symptoms in Eye Diseases,"[1] in which he says: "The only systematic investigations made before 1883 were those of Förster and his pupils. Some important

[1] Pp. 74 to 77.

results were got from these investigations, principally with reference to the symptoms of syphilitic choroiditis, for which diseases the enormous diminution of the light sense, tested by Förster's or any other similar method, is all but characteristic." An important advance was made by Bjerrum in 1883. To him we owe the recognition of the distinction between the light perceptive power and the light difference power already referred to, and he found that "diseases primarily involving the choroid and retina show more or less tendency to a deviation in the first respect; those primarily involving the nervous elements in the retina or optic nerve to a deviation in the latter respect." In a paper communicated to the ophthalmic section of the last International Congress, Samelsohn sums up the conditions in which, so far as our present knowledge goes, an examination of the light sense is likely to be of diagnostic or prognostic significance. They are: (1) "certain forms of dense vitreous opacities in which there might be a doubt as to the existence or not of detachment of the retina. In such cases, if the light difference power is not affected, there is not likely to be any detachment; (2) in cases where the differential diagnosis between glaucoma simplex and optic atrophy presents great difficulties, a relatively great diminution in the power of perceiving feeble illuminations, combined with a relatively small interference with that of distinguishing between different intensities of light, is suggestive of glaucoma, the opposite condition suggestive of atrophy; and (3) in cases of immature cataract, when there is any suspicion of the visual acuity not corresponding to the degree of opacity of the lens, the examination of the second factor of the light sense is of importance in enabling one to exclude the likelihood of a complication with optic atrophy."

Since the above was written, our knowledge has not been greatly increased, and it is with the hope of arousing fresh interest in the question that this paper is published.

While resident surgeon at the Birmingham and Midland Eye Hospital, my attention was turned to the subject, and some time was spent in devising a photometer which would meet various defects in the instruments used abroad, to be hereafter referred to; in finding the standard light perceptive power of healthy eyes, with which comparison might be made; and in classifying the light perceptive power of eyes affected by diseases of various kinds.

It is an analysis of observations made on 107 patients, or 203 eyes, with some conclusions and suggestions founded thereon, that forms the subject of the following pages.

Various instruments have been devised to measure the minimum amount of light perceived, but all that I have seen or read of suffer from one of two faults—either the light used as a test is not a constant one, or the form sense is also taken into account. For example, in the photometer[1] made by Izard and Chibret, the sky is used as the light to be looked at, but, as in this country, at any rate, daylight is anything but a constant quantity, comparisons based on such a standard must prove unreliable. Again, we shall see that frequently the light perceptive power is normal, while the form sense is much diminished, and *vice versâ*, so that conclusions formed from results in which each factor is not separately dealt with cannot but be fallacious.

Before proceeding to describe my own photometer, I shall briefly describe that in most common use abroad,

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[1] *Vide* Swanzy, "Handbook of Diseases of the Eye," 5th edition, p. 16.

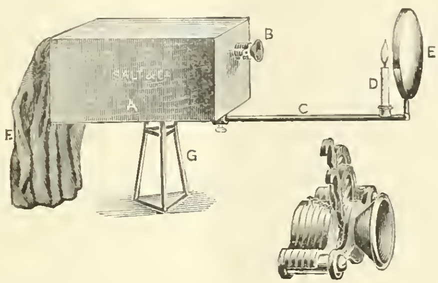
that the points of difference may be more clearly understood.

That best known to ophthalmologists is Förster's, described by Fuchs as follows : "It is an oblong box, blackened on the inside ; on the anterior wall are two apertures for the eyes, which look on a plate on the posterior wall, on which are placed stripes as test objects." In that supplied to the hospital these were so arranged as to form a word. "The illumination is made by a candle of standard strength, the light from which passes through a window, through greased paper, that the light may be uniformly diffused. This window may be closed entirely, or opened to the extent of five square centimetres" by a beautiful mechanism, which is a modification of the Iris stop diaphragm.

The best point about the instrument is that the source of illumination is a constant quantity, but the confusion of form sense with light perception, the testing both eyes simultaneously, the greased paper with its varying degree of transparency, which prevents the intensity of the light being uniformly increased as the area through which the light enters the box is enlarged, and last, but not least, the risk the patient runs of having the hair singed by the close proximity of the candle to the head, all tend to diminish its usefulness. The photometer made by Messrs. Salt and Son, of Birmingham, to my orders, has the following advantages : There is no confusion of light sense with form sense, as the patient simply says when light is perceived ; the light used is a constant one—the standard candle ; the variation in the intensity of the light is produced not by an alteration in the size of the illuminating area, but by the removal of a series of opal discs of standard density, arranged in a manner about to be described.

The instrument consists of an oblong box, A, open at the anterior end, through which the person examined

looks ; to the margin of this opening a hood, F, is affixed, which is drawn over the patient's head to exclude any external light from the candle. At the posterior end is an aperture, opposite which are nine discs of "15 oz." standard opal, B, so arranged that one by one they can be swung back. Behind that, on a bar, C, distant a third of a metre from the box, is a standard candle, D, in a spring holder, keeping the flame at a constant level ; behind this is a shade, E, to prevent any flickering. The instrumen rests on a weighted stand, G.



The method of use is as follows. The person whose light perceptive power is to be tested is kept in the dark for about five minutes till the retina has become adapted to the darkness. He then sits as above described, and the eye not under examination is covered with a shade, care being taken not to exercise any pressure. The head having been covered with the hood, the opal discs are one by one removed, and the patient is told to say when he detects any light ; should he detect it through 7 opals his light perceptive power is registered as 7, if through 6, 5, 4, &c., 6, 5, 4, is entered ; a note is also made of sex, age, and condition of fundus. The figures given in the following tables were obtained in the manner above described.

The first table shows the result obtained on exam-

ining fifty eyes of persons, both of whose eyes were healthy. The last column indicates the number of opals through which light was perceived.

Average for all ages, 50 eyes = 5·24.

AVERAGES FOR THE SEVERAL DECADES.

14 eyes	between	10 and 20	= 5·714.	Highest 7, lowest 4, eleven 6.
8 ,,	,,	20 ,, 30	= 6·375.	Five 6, three 7.
6 ,,	,,	30 ,, 40	= 5·16.	Five 5, one 6.
12 ,,	,,	40 ,, 50	= 4·77.	Two 6, five 5, four 4, one 3.
2 ,,	,,	50 ,, 60	= 5·5.	One 6, one 5.
8 ,,	over	60	= 4·125.	Seven 4, one 5.

These figures would tend to show that the light perceptive power is greatest in early and middle life, and gradually diminishes with the advance of years; I am inclined to think that had a large number of people been examined between 50 and 60, the average would have have fallen into its proper place in a descending scale.

Next, coming to nine cases in which one eye was healthy, while the other was either removed or totally blind, the results are:—

1 eye	under	10	= 7.	
3 eyes	between	10 and 20	= 6·6.	Two 7, one 6.
1 eye	,,	20 ,, 30	= 6.	
1 ,,	,,	30 ,, 40	= 7.	
3 eyes	,,	40 ,, 50	= 6.	All 6.

From which it would seem that the loss of an eye renders the light perceptive power of the remaining eye, when healthy, higher than usual, in every case higher than the average given above for the corresponding decade.

Before passing to the figures for diseased eyes, we may consider an objection to the value of observations made in a dark room on those affected with ocular disease; viz., that it is assumed that the adaptive power of the retina in diseased conditions is the same as in healthy eyes. While quite admitting that there may be a great difference, yet, if in all cases of certain

diseases we find that after five minutes in a dark room the light perceptive power is much below the normal, that fact is a valuable diagnostic aid, whether it be due to a deficient power of retinal adaptation, or to actual diminution in the light perceptive power.

These tables do not indicate the greatest light perceptive power that might be attained, were the patients kept in the dark for some hours or days, but simply that present after seclusion from light for five minutes.

The average for 38 eyes with toxic amblyopia was 5·3, or including three patients at first placed under that heading on the grounds of being smokers, having a central scotoma for colour, seeing better in a dull light, having full field and apparently normal fundus, to which reference will hereafter be made, 4·84.

10 eyes with optic neuritis = 4·2.
9 ,, ,, optic atrophy of a marked character = 4·2.
2 ,, ,, hyalitis and vitreous opacities = 5.
1 ,, ,, sub-hyaloid hæmorrhage = 4.
6 ,, ,, active choroiditis = 4·83.
3 ,, ,, choroido-retinal atrophy = 2.
4 ,, ,, glaucoma simplex = 2.
5 ,, ,, hemeralopia = 2.
4 ,, ,, retinitis of doubtful origin = 3.
8 ,, ,, ,, albuminurica = 3·125.
4 ,, ,, ,, diabetica = 3.
8 ,, ,, ,, pigmentosa = 2·625.
9 ,, ,, miners' nystagmus = 5·3.
12 ,, of persons suffering from anæmia = 5·25.

While considering that the low figure in hemeralopia is chiefly due, as Treitel states, to defective retinal adaptation, there also seems to be some diminution of the light perceptive power. The three cases referred to under the head of toxic amblyopia were the following:—

(*a*) A man, aged 45, presenting the symptoms of tobacco amblyopia; his light perceptive power was tested, and found to be 2 instead of 5 or over, as that of most cases was. My suspicions as to the correctness of the diagnosis made were aroused, and his urine,

having been examined, was found to contain a large quantity of sugar.

(*b*) A man, aged 48, with similar history and symptoms to the last; his light perceptive power proving to be only 4 in each eye, the urine was examined, and albumen in considerable quantity was found. This case afterwards developed an albuminuric retinitis.

(*c*) A man, who had only one eye affected. The diagnosis lay between toxic amblyopia, incipient atrophy, and chronic glaucoma. His light perceptive power was 4 in the affected eye, 6 in the healthy eye. I am inclined to think the last-mentioned disease was present, as in *incipient* atrophy the light perceptive power is but very slightly diminished.

A fourth case is included in the above, in which the light perceptive power was only 4, but a rather dense corneal nebula may have been the cause of the diminution.

Before drawing any conclusions from these tables, I shall give for what it is worth, a table contrasting the form sense, tested by Snellen's test types, *without correction of refractive error*, and the light perceptive power.

Average Light Perceptive Power of

66	eyes seeing	$\frac{6}{6}$	$= 5{\cdot}13$.
16	,, ,,	$\frac{6}{8}$	$= 4{\cdot}8$.
15	,, ,,	$\frac{6}{12}$	$= 4{\cdot}59$.
30	,, ,,	$\frac{6}{18}$	$= 4{\cdot}425$.
11	,, ,,	$\frac{6}{24}$	$= 4{\cdot}45$.
13	,, ,,	$\frac{6}{36}$	$= 4{\cdot}85$.
8	,, ,,	$\frac{6}{60}$	$= 5{\cdot}625$.
44	,, no type		$= 3{\cdot}18$.

Contrary to what might have been expected, the light perceptive power does not, except in the last instance, vary to any very marked extent with the form sense. It is a matter of much regret to me, that the refraction was not noted in each case, but unfortunately one

often only finds out one's mistakes too late to rectify them, and though the refraction has in some instances been entered, the cases are too few to give any reliable figures.

Conclusions and Suggestions. — As regards healthy eyes, we see that the light perceptive power is not a constant quantity, but begins to diminish after 30, and most markedly after 60. This is to some extent in harmony with Ole Bull's statement, that the light perceptive power is about equal in people with healthy eyes up to 50, after which there is a falling off.

As to refraction, it has been stated that eyes with a hypermetropia of 4 D. or over have a diminished light perceptive power, while in some few myopes that have come under my own notice it has certainly been above normal, but as I have said, the cases are too few to give any sure data.

On considering the various diseases in which the light perceptive power is most diminished, we find that it is in those in which the retina is most affected, either by pressure or by a poisoned condition of blood ; so that a healthy nutrition of the retinal elements is the first essential to good light perception. Further, it is possible that the fibres of the optic nerve which pass to the light sense centre are of a nature less prone to degenerate, and different to those passing to the form sense centre or colour sense centre ; otherwise it is hard to explain how it comes that in retro-ocular neuritis of toxic origin the light perceptive power should remain unimpaired, while the form and colour senses are so seriously affected. This view is also supported by those cases of hemianopia in which the light sense remains unimpaired, while the form and colour senses are destroyed.

The practical points as regards diagnosis and prognosis appear to be the following :—

In cases of amblyopia, with normal fundus (or at

most slight pallor of temporal side of disc) and central colour scotoma, if the light perceptive power be normal the case is probably one of toxic amblyopia; if the visual field be full, nicotine is the determining cause; if spirally contracted (a "retinal exhaustion" field) alcohol is the predominating factor. In both cases the prognosis is good as to ultimate recovery; in the former it may, and probably will, take months, in the latter, weeks. If the fundus appear normal, but the form sense be reduced, with a central colour scotoma and full visual field, while the light perceptive power is 4 or under, the case is probably not a pure case of toxic amblyopia, and the urine should be examined for albumen or sugar.

It seems probable that by further investigation in cases of albuminuria and diabetes, a valuable indication of the progress of the disease may be afforded by the alteration in the light perceptive power, as when that has once become diminished through lack of retinal nutrition, retinitis must soon make itself manifest, after which the patient's life is unlikely to be prolonged beyond eighteen months or two years. If the fundus appear normal, the form sense be somewhat diminished, the field show some concentric contraction, and the light perceptive power be slightly subnormal, the case is probably one of incipient optic atrophy, and the prognosis is necessarily grave.

In cases in which there is some doubt as to whether the patients have atrophy or glaucoma simplex, without perceptibly increased tension, the knowledge that the light perceptive power is, as Samelsohn has pointed out, very much lessened, will give much assistance.

The progress of optic neuritis, and the damage done to the retina, may also be gauged by the diminution or otherwise of the light perceptive power, as when that is seriously affected the prospects of a good recovery are

bad. The failure I would suggest is chiefly due to interference with nutrition of the retinal elements, rather than to pressure on the light conducting fibres of the optic nerve.

Whether choroiditis has or has not affected the retina by extension of inflammation may be told in a similar manner, as the light perceptive power does not appear to be very seriously diminished *until* the retina becomes affected ; and as it is in the latter case that serious after results are to be feared, the light sense aids us in giving a prognosis.

The instances in which we find the greatest diminution are those of retinitis, in which, of course, the nutrition of the cells is most seriously interfered with ; especially is this the case with retinitis pigmentosa, where there is a proliferation of cells around the blood-vessels, which, becoming contracted, are unable to convey to the retinal elements a due amount of nutritive material.

As far as the cases examined of anæmia show, the light perceptive power is about normal, except in one or two extreme cases in which the pupils were also much dilated. These latter may perhaps support Eales' suggestion that the dilated pupil in marked anæmia is due to a defective light perception.

That there was no diminution in those suffering from miners' nystagmus may point to this affection being due rather to muscle strain than to deficient light.

In the above observations attention has been devoted solely to the light perceptive power as distinguished from the light difference power, which has already been widely studied both in this country and abroad ; the former is still a comparatively unknown subject, and these tables and suggestions are published in the hope that they may increase, even though it be but a little, our knowledge of this branch of the light sense problem.

OVIO (Padua). On the Phenomenon of Unequal Accommodation. *Annali di Ottamol., part iii.*, 1895.

Ovio deals at length with this question. He begins by pointing out that association of movement of the two eyes must be accepted as a general law, deviation from which is very exceptional. In spite of apparent exceptions, there is a strict synergic association between accommodation and convergence. He insists that the impulse for the performance of associated movement is equal in both eyes, though the results may be unequal. Fick admits four possibilities with regard to accommodation in the two eyes:—

(1) Equal impulse, with result (*a*) equal, (*b*) unequal.

(2) Unequal impulse, with result (*a*) unequal, (*b*) equal.

The first two possibilities constitute the general rule, the other two, even in the opinion of those who admit them, can only be the exception. An example of equal impulse having unequal effects is afforded by Secondi, who has shown that in looking at an object placed to one side, the fixing eye in the position of divergence accommodates less than the fixing eye in the position of convergence, *i.e.*, a maximum effort of accommodation carries less effect if the eye be turned outwards, greater if turned inwards. But this fact is somewhat neutralised by another, viz., that the refraction of the eye diminishes with the obliquity of line of fixation; therefore, in looking at a lateral object the refraction is less in the converging than in the diverging fixing eye. In anisometropia the two eyes are naturally adapted for different distances, and therefore the same amount of accommodation produces different results; the nervous impulse to accommodation is equal in both eyes, and this rule is not set aside even in the interests of binocular vision; though some have claimed that the impulse to the two eyes, in these cases, can be different.

After these preliminary statements, Ovio summarises and passes in review the writings and experiments re-

lating to the subject, particularly those of Graefe, Donders, Hering, Schweigger, Rumpf, Hess; Buffon, Kaiser, Schneller and Fick. The latter have devised experiments showing as they thought the existence of unequal accommodation, whilst the former have repeated these experiments and shown for the most part their inconclusiveness, or performed others which throw doubt on the possibility of such unequal accommodation.

The following is an outline of the experiments performed by Ovio, and of the conclusions he draws from them :—

Series I.

To what extent is the confused image of one eye helpful in binocular vision?

The subjects of experiment were himself, another doctor (Cassiani), and a girl (Genoveffa) with V. in R. eye $\frac{1}{20}$ (old atrophic choroiditis), in L. $\frac{9}{10}$.

(*a*) Hering's apparatus for testing binocular vision was used, and imitation pearls dropped in front of or behind a vertical pin 5 cm. from anterior end of tube. (1) With both eyes open. (2) One eye open. (3) With successive lenses before one eye, the other also being open.

Results.—(1) No mistakes. (2) 19 to 20 mistakes or uncertainties. (3) With lenses of 1, 2, 4D. no mistakes; with 6D. 3 mistakes (in 25 trials); with 9D. 9 mistakes (in 25 trials). Cassiani with 4D. made as many mistakes as with one eye alone. Genoveffa saw less well with both eyes than with the left only.

(*b*) Same apparatus but tube much flatter, and instead of pearls the position of a vertically stretched movable hair is gauged, with reference to the pin, under the same conditions (1), (2) and (3) as in (*a*).

Results.—(1) No mistakes. (2) More often wrong than right. (3) With 1D. before one eye no mistakes; with 2D. 10 to 15 mistakes out of 25 trials; with 3D. the mistakes were much more numerous. Genoveffa made 18 to 20 mistakes when both eyes were open, and with the left alone.

(*c*) The pin is lowered, so that only the head is seen.

Note how often it can be touched with the head of a needle fixed in the end of a stick.

Results.—With 1D. before one eye no mistakes. With 2D. more often failures than successes. Genoveffa made no mistakes.

(*d*) A tube 12 cm. long and with a lumen ·5 cm. in diameter is fixed transversely before the face and at arm's length; a needle fixed in the end of a stick has to be passed into either end. As before, (1) with both eyes, (2) with one eye, (3) with both eyes, but a lens before one eye.

Results.—(1) No failures. (2) Only succeeded now and then. (3) With 1D. no failures; with 2D. no failures; with 3D. 3 failures; with 4D. 16 failures. Vettorato Virginia, aged 21, schoolmistress (L. emmetropic, V. = 1, R. myopic 10D., V. = $\frac{1}{3}$ about), asserted that she saw just as well with the better eye alone as with both; she succeeded perfectly in introducing the needle into the tube. Genoveffa succeeded equally well. A student of 17 with M. of 2D. in the right eye and 1·5D. in the left, also succeeded each time.

(*e*) Experiment, with reading type of different sizes, and having before one eye varying + or — lenses.

Results.— + 1D. had no effect. + 2D. caused a slight haziness. + 3D. caused a slight haziness. + 4D. caused so much blurring that reading was scarcely possible; the smaller the letters the greater was the blurring. With — lenses the disturbance was much less.

This first series of experiments was made in order to see whether the confused image of one eye does or does not help to disturb binocular vision, and different results were obtained according to the mode of experimentation. In none (except in the reading experiments) did the confused image of one eye disturb binocular vision; at the most, it did not help binocular vision. In persons with defective sight it was manifestly a help, although Genoveffa (in whom one eye was highly amblyopic) affirmed that she saw better with one eye alone than with both. It is clear that such persons were able through custom to make use of the confused image, whilst people with both eyes

equally good sighted, in whom one image is artificially made confused, cannot make use of it.

In Genoveffa, the result of the experiment *b*, 2, was in contradiction with those which she gave in the other experiments. But the contradiction is at once cleared up when we consider that one eye was very amblyopic and incapable of seeing the hair at all.

In the reading test the confused image did cause disturbance of vision, which was more marked the smaller the types were, the confusion being due to circles of diffusion. A positive lens caused more disturbance than a negative one, inasmuch as the confused image is larger with the former, and thus is more disturbing to the clear image seen with the other eye.

Series II.

To what extent can the eye tolerate dioptric errors?

(*a*) Experiment, with Snellen's reading types placed at 1 m., 50 cm., or 30 cm.; + lenses, increasing in strength, being placed before both eyes.

(*b*) Experiment, with Burchard's stereoscopic apparatus for detecting simulation. Burchard's cards of letters and figures are successively put in the apparatus at the distance of distinct vision, and looked at with both eyes through progressively stronger lenses.

(*c*) (1) Snellen's 0·5 type is placed at 50 cm., and 5 cm. in front of it a horizontal hair is stretched. Fix with one eye first the type then the hair, then a mid-distance between them. Ditto, with the hair 10 cm., 15 cm., 20 cm. in front of the type. (2) Also with Sn. 0·8. (3) And again, with a smoked glass before the eye, such that Sn. 0·5 can be read at 50 cm.

The series was devised to test the toleration of the eye for dioptric errors. The results showed that the eye tolerates much larger errors when the test objects are large. Thus, for the same degree of error, letters appear much more confused when they are smaller. In this way the hair (experiment II., *c*) placed before the letters almost

disappears if one accommodates for the letters, whilst if one accommodates for the hair the letters are still legible, and the more so the larger they are; but in such cases if the error is considerable, the confusion is greater than before, since a large letter is seen in all its detail better than a small one (experiment II., *c*, 2). The experiment then succeeds best with a weak illumination (experiment II., *c*, 3), any blurring appearing less distinct.

In these last experiments it is to be noted how very easily both eyes accommodate for a middle distance, and in this way objects situated at different distances can be seen clearly at the same time. Unequal accommodation therefore, is *not* the explanation of such cases.

Series III.

Experiments made with doubling of the images.

(*a*) A line of diamond letters, 11 cm. long, is looked at from a distance of 15 cm., one end of the line being 7 cm. to the right of the middle line. Before each eye is a prism of 3°, bases horizontal, but opposite. The head being kept straight, the farther end of the line is fixed; the image which corresponds to the nearer eye appears larger and a little less black than the other.

Do the same experiment without prisms and holding the card at 10 cm. The point of a needle may be used instead of printed characters.

(*b*) Same experiment, but instead of letters on a card use Graefe's thread optometer.

(*c*) In the same manner, but using only a single prism, look at end of a horizontal thread 7 cm. to the right of the middle line and 15 cm. from the observer. Use first a prism of 3°, base up, before left eye, then before the right eye, and finally one of 5° before the right eye. Note the different results.

(*d*) Woinow's experiment with a fissure covered with cobalt glass, Ovio found difficult and unsatisfactory.

In this series the results showed that the method of doubling the images is but little fitted to the study of the phenomena of accommodation.

In the experiments made by holding the objects to one side and looking at them obliquely, the double images appeared very little different one from the other, although there should have been a difference of more than 1D. between the two eyes. Probably this was owing to a compensation determined by the obliquity of fixation.

It was only when the horizontal thread (experiment III., *c*) was used that a difference in clearness of the two images became manifest; but this seems to Ovio an effect of the prism. In fact, in the first case the maximum separation of the images was at the right extremity, *i.e.*, at the maximum distance from the middle line; and there, one image appeared clear, the other confused; but in the second case, the maximum separation of the two images occurred at the middle line, and it was here that one image was clear and the other confused; an evident indication that it was not from the obliquity of the vision, but from the effect of the prism in causing one of the images to fall outside of the macula lutea, that the blurring of one image depended. So true is this, that in the third case, at the right extremity where the two images were very close together, they appeared both equally clear, whilst again at the middle line where they were separated, the one was clear and the other blurred.

Series IV.

(*a*) (1) Two pins are fixed vertically on a table, one 50 cm. away, the other 33 cm. and a little to one side. Background — a frosted window. They are looked at through two horizontal tubes. (2) Do the same experiment, one pin being at 50 cm. the other at 25; (3) also at 33 and 20 cm.; (4) and at 20 and 16·6 cm. (5) Repeat, looking at one of the two pins through two holes, 1 mm. apart, in a card.

In the above cases it is to be noted that the images are only clear when one accommodates for a mid-distance between the two objects, whilst if one accommodates exactly for one, the other is hazy. The haziness is greater for the near object when one fixes the more distant, than it is for the distant object when one fixes the near.

(*b*) Same experiment, but make use of two hairs—one vertical, the other slightly oblique; (1) first when they are respectively 50 and 33 cm. distant; (2) then 50 and 25; (3) and finally both at 50 cm., but with a + and — 1D. before one eye.

(*c*) Mark a horizontal line of ink dots on two cards, one 50 cm., the other 33 cm. distant; look at them through the usual two tubes. Separate or approach the two cards till the two lines of dots seem to form one line. In this way all the points appear equally clear, and it is impossible to distinguish which points are seen with one eye, and which with the other. When the cards are 50 and 25 cm. distant, the dots are equally clear, but the nearer are larger. On close observation there is in all cases a difference in blackness.

Series V.

Repeat all these experiments (series 4), but with one eye only—looking through horizontal tube.

The results are practically identical with the results obtained binocularly.

This series of experiments was made with the object of seeing whether it was possible to determine and recognise the existence of unequal accommodation. With the two eyes one succeeded sometimes in seeing clearly two objects placed at unequal distances. But the fact that the smaller the objects the less could they be separated if they were to continue to be seen clearly, supported the idea that it was owing to the dioptric error being neglected rather than to unequal accommodation. So Ovio repeated the experiments but with one eye only (series 5), and got practically the same results; this seemed to him a conclusive proof that one was dealing with toleration of circles of diffusion and not unequal accommodation. With two eyes, however, one saw a little better than with one; but this is only to be expected, and the advantage of binocular vision over monocular is not to be ascribed to unequal accommodation.

In experiment IV., *a*, 2, the nearer pin when fixed appeared

as clear and distinct as the more distant; but on fixing the more distant the nearer pin appeared blurred. In the latter case the nearer image is the larger. A slight blurring, which in the more distant pin passes unobserved, eludes one less easily in the nearer pin. For the same reason a difference of 1D. is better supported at some distance from the eye than near it; hence two pins placed one at 50, the other at 33 cm., are both clearly seen more easily than when placed the one at 20 and the other at 16·6 cm. When the card with two holes in it is placed before one eye (experiment IV., *a*, 5) the same objects are seen better than when the card is not employed, the circles of diffusion being less.

In the experiment with the two hairs placed at the same distance and looked at with both eyes, before one of which lenses are placed (expriment IV., *b*, 3), the image was more confused when the lens was positive. Why? Ovio does not know the explanation, but thinks it is certainly not due to unequal accommodation; for if this happened, one ought to get unequal relaxation as well as unequal tension of accommodation, and this whether a convex or a concave lens be used.

Series VI.

(1) *Experiments with stereoscope.*

(*a*) Burchard's cards, containing figures or letters, are regarded at the distance of distinct vision; before one eye is put a ± lens. — 1D. was tolerated as if it were not present. + 1D. caused some confusion. — 2D. caused confusion, but much less than + 1D.

(*b*) A card in which a number of very fine holes are pricked, and held against the light, gives the same results.

(*c*) In a card make two windows, each 1 cm. square; looked at in stereoscope at proper distance they fuse into one. Fix a hair before each; vertically before one, horizontally before the other. They form a cross; now look at them after putting ± lenses before one eye.

(2) *Stereoscopic experiments practised on anisometropes.*

(*a*) Girl 21 years old; R. — 10D.; L. emmetropic. In the stereoscope the figures on Burchard's No. 1 card appeared confused to the right eye.

(*b*) Student of 17; R. — 2D.; L. — 1·5D. In stereoscopic trials he always sees one image more clearly than the other.

(*c*) S. G., a doctor; R. — 2.; L. — 3. At first he sees the figures in table 1 (Burchard) corresponding to the left eye, a little confused; but shortly after he can read them as well as with the right. Table 5 (Burchard): at first he sees the letters corresponding to left eye somewhat confused, then a little clearer, but not as clear as with the right eye.

The stereoscopic experiments of series VI. had the same object in view as the immediately preceding series of experiments. Convex lenses caused much more disturbance than negative lenses. This seemed to indicate unequal accommodation, since with the stereoscope, the experiments being made with complete relaxation of accommodation, accommodation could only manifest itself by unequal tension, viz., by overcoming the action of negative lenses; it could not manifest itself by unequal relaxation, which would have been necessary in order to overcome the action of positive lenses, inasmuch as accommodation to begin with was completely relaxed. Therefore, if the phenomenon of unequal accommodation does not exist, and the eye sees badly with a convex lens before it, it ought equally to see badly with a corresponding negative lens before it, each determining an equal error of refraction. The negative lens, however, caused less disturbance; therefore the error would appear to be overcome by unequal accommodation.

Nevertheless, a little consideration shows that the phenomenon results not from unequal but from ordinary accommodation. On placing a + lens before the eye it determines an error which accommodation can only make worse; the action of a negative lens can, however, be neutralised by accommodative action. Naturally this action occurs in both eyes equally, and a dioptric error is induced

in the second eye (before which there is no lens) with confusion of the image. Now in the stereoscope the marks which ought to be seen by one eye are at a certain distance from those seen by the other, and therefore it is not possible to fix both of them well, one belonging to one eye and the other to the other, so to speak. But with attention one is conscious of the sensation of passing from one to the other, and when one holds the eyes fixed only one mark is clearly seen, whilst if the gaze is directed to the other the first mark is no longer well seen. This sensation is still more noticeable when the concave lens before one eye is made stronger, and if the gaze is shifted rapidly from one image to the other vertigo is developed, and the eye becomes so habituated to this movement, which is indeed alternate accommodation, that on removing the lens the process continues for a short time and vision is confused.

To avoid this, it is advisable to make use of two hairs which form a cross (experiment VI., 1, *c*). On looking carefully at the point of crossing, one can determine, in spite of the great disturbance which the struggle of the visual fields causes, that the lenses cause much less disturbance than before, and that it is the same both for + and for — lenses. If, then, the two images appear equal, the fact is to be ascribed entirely to tolerance of the dioptric error, and not at all to unequal accommodation.

What conclusions are to be drawn from the other cases of anisometropia? In the first where the anisometropia was high, the image corresponding to the eye with greatest refractive error was very confused and remained so. In the other two cases the image, confused at first, in a short time became almost as clear as the other. Was this an effect of unequal accommodation? It is at least doubtful. On the one hand it is open to us to think that both eyes are accommodating for a mean distance, or, on the other, that other elements have entered into play, which have a modifying effect on accommodation; such as contraction of the orbicularis, of the recti, or partial contraction of the ciliary muscle, to which Hensen and Voelckers,

Giraud Teulon, Javal, Martin, Reymond, &c., have drawn attention. It would seem, then, that unequal accommodation has not yet been demonstrated by anyone.

W. WATSON GRIFFIN.

E. FUCHS (Vienna). Periodic Transient Episcleritis. *V. Graefe's Archiv, vol. xli., part iv., p.* 229.

A communication on this subject was read by the author in the Ophthalmological Section of the annual meeting of the British Medical Association in London, in July, 1895 (see *British Medical Journal*, October 19, 1895, p. 951). He now resumes the subject, and amplifies it with the details of twenty-two cases. We shall here merely attempt to summarise his observations.

The disease presents a characteristic group of symptoms. It is a recurrent inflammation affecting the ocular conjunctiva, and especially the subjacent loose vascular episcleral tissue. The vascular injection is of violet colour and is often accompanied by considerable swelling of the inflamed tissues, but there is neither an increase of secretion as in catarrh, nor a hard infiltration as in ordinary episcleritis.

In severe cases the inflammation may completely surround the cornea. Usually it occupies one or more quadrants of the ocular surface, and moves in the course of a few days from one part of the circle to another, or from one eye to the other. The unaffected parts and the retrotarsal fold retain their normal paleness. This partial distribution distinguishes it at once from an ordinary acute conjunctivitis. From an ordinary episcleritis it is distinguished by its greater tendency to periodic recurrence, and by the absence of the inflammatory node which in the

latter often lasts for weeks and leaves behind it a discolouration of the sclera.

It affects both eyes, sometimes alternately, sometimes together, and varies in this respect in the same individual.

The inflammation is accompanied by pain, lacrymation, and photophobia, sometimes slight, sometimes rather severe. The inflamed area is tender to touch through the lids. The pains when severe are of a neuralgic character, and radiate in the neighbourhood of the eye and as far as the occiput. In some cases they have the character of migraine. As a rule they appear before the visible inflammation of the eye, and disappear either when the redness becomes developed, or at any rate before it subsides. Occasionally the redness appears simultaneously with the pain, or even precedes it. In many of the severer cases there is swelling of the lids, and in one instance the glands in front of the ear were affected.

The cornea was affected in two cases only out of the twenty-two, in one instance presenting points of grey opacity over its whole surface, in the other minute infiltrations followed by ulceration near the margin.

When the inflammation is exceptionally severe, the iris and ciliary body, the ocular muscles, and the retrobulbar tissue are more or less involved. Hyperæmia of the iris is manifested by a change of colour and a narrowing of the pupil ; a true iritis was never met with. Affection of the ciliary body is manifested by the deep ciliary injection which sometimes persists after the conjunctiva has recovered its normal condition, and by the pain which accompanies the effort of accommodation ; it occasionally leads to spasm of the accommodation and consequent myopia. An astigmatism, apparently caused by unequal contraction of the ciliary muscle, was observed in one case. The affection of the external muscles and retrobulbar tissues is shown by the pain often complained of on lateral or convergent movements of the eyes, and by the proptosis which is sometimes present in very severe cases.

The duration of an attack is in some cases only one or two days, in others six or eight ; a very severe attack,

such as occurs only once or twice in a year, may last several weeks.

The intervals between the attacks vary much in length. Some patients have only two or three attacks in a year, others an attack every few weeks.

The liability to this disorder usually persists over several, and sometimes over many, years. Of the twenty-two patients in question, eight have become free from the disease, after having been liable to it over periods varying from one to twenty years. In eight other cases the disease still persists more or less, after having already lasted from seven to ten years. In the remainder, no information as to the later condition of the patients was forthcoming.

The disease under consideration is not now described for the first time. Von Graefe described it more than twenty-five years ago—a fact which was not known to Fuchs when he made his former communication. Hutchinson in his Bowman Lecture to the Ophthalmological Society (see *Trans.*, vol. v., p. 6), described under the name of " hot eye " a condition arising in gouty subjects, which is allied to if not identical with that here described. Nettleship brought before the same Society (*Trans.*, vol. viii., p. 95) a series of cases, some of which answer closely to the description here given. Some other isolated cases are also referred to in the article before us.

As regards etiology, it is noteworthy that of the twenty-two patients seen by Fuchs, fifteen were men, seven women; and that all belonged to the middle period of life, the youngest being 21 years of age, the eldest 51. The cause is certainly a constitutional one, and is probably to be found in some fault of nutrition or elimination. The commonly accredited diathetic conditions are gout and rheumatism. More than half of Fuchs' patients were met with in private practice, and many of them manifestly lived too well and presented an excess of urates in the urine. On the other hand it is to be noted that not one of the patients presented other definite signs of gout, and that in Austria gout is a very uncommon disorder. One patient only gave clear evidence of rheumatism; he had

suffered from two attacks of acute arthritic rheumatism, and the eye affection was cut short by salicylate of soda. In several cases there was reason to suspect a connection with intermittent fever; there was no definite history of it, but the spleen was enlarged, the attack began with febrile symptoms, and quinine appeared to prevent relapse. In several cases the pain was of the character of migraine, and in two the patients suffered from typical migraine between the eye attacks. A connection with disturbances of menstruation was not discoverable in any case. In two cases the eye attacks were associated with urticaria. In persons whose constitutional condition predisposes to the disorder, exposure to cold or draught may induce it.

The best method of treating the disorder appears to be a careful regulation of diet with regard to the uric acid diathesis, and the employment of salicylate of soda. In some cases quinine seemed to prevent recurrence, and one was benefited by the extraction of a troublesome tooth.

Fuchs concludes his article by referring briefly to two other recurrent disorders which probably are somewhat analogous to the disease above described, namely, recurrent œdema of the lids and recurrent erosion of the cornea. P. S.

AMERICAN MEDICAL ASSOCIATION, 1895—SECTION OF OPHTHALMOLOGY.

(*Continued from page* 32.)

Hæmorrhage into Retina and Vitreous with Disease of the Retinal Veins.—Dr. H. Friedenwald, of Baltimore, reported two cases occurring in young persons. The first patient, a healthy boy of 15, had previously suffered from intermittent fever. He came for slight pain in the eyes, and the ophthalmoscope revealed peripheral small spots of hæmorrhage, especially in the upper part of the retina. The arteries were only slightly full and tortuous. The veins

were much distended and the smaller ones very tortuous. Three weeks later a large hæmorrhage appeared in the upper part of the retina. This was subhyaloid; and, watched from day to day, was seen to settle down, passing to the temporal side of the macula, showing as it made its way round it a concave border toward the macula which corresponded in position to the macular reflex. After several days the hæmorrhage was absorbed, the last traces to disappear being almost below the macula. At this time the retinal veins had become very irregular in calibre. Soon after, fine vessels were seen at certain points extending into the vitreous; and on one of the veins was a small varicose dilatation which markedly diminished under pressure on the globe. Subsequently hæmorrhages recurred, once after recurrence of malarial chills. When last seen there were large masses of vascularised connective tissue in the periphery of the vitreous.

The second case was that of a healthy man, aged 22, who, a year before, had suffered loss of sight which a competent ophthalmic surgeon had diagnosed as from hæmorrhage into the vitreous. In three or four months the sight was restored, he considered, to its full extent. There was a pillar of white connective tissue projecting from the centre of the disc, with loops of fine vessels coming forward into the vitreous, both round its base and at its free extremity. The retinal veins were irregular in calibre and some of them tortuous; and on three different branches were three varices, the largest two or three times the diameter of a retinal artery of the first order, all of which could be diminished and, indeed, almost obliterated by pressure on the eye-ball.

Prognostic Significance of Albuminuric Retinitis.—Dr. E. O. Belt, of Washington, had collected and tabulated from the literature of the subject and his own practice and that of other surgeons 419 cases in which the continuance of life after the recognition of the retinal lesion had been noted. Of cases in private practice 62 per cent. died in the first year, and 14 per cent. lived more than two years.

Of cases in hospital practice 85 per cent. died in the first year, and only 6 per cent. lived more than two years. Of all cases 65 per cent. died within one year, and 6 per cent. lived more than two years. One patient had survived seventeen years; but several surgeons of large experience had seen none who survived more than two years. The better prognosis in private practice is to be ascribed to hygienic surroundings.

Colloid Changes in the Choroid.—Dr. J. T. Carpenter, Jr., Philadelphia, reported six cases of fundus changes due to colloid degeneration of the vitreous lamina of the choroid. His patients ranged from 38 to 70 years of age, and all had normal or very nearly normal vision. He would divide the cases into two groups: the first corresponding to the "guttate choroiditis" of Tay and Nettleship; the second including the large globular acinous masses, similar in appearance to *Drüsen*. As there are no evidences of inflammation in connection with the formation of such bodies, the word choroiditis is inappropriate. He regards the identity of such choroidal formations with the *Drüsen* of the nerve head as still unsettled. In one of his cases both conditions were present.

Operations on the Ocular Muscles.—Dr. Leartus Connor, of Detroit, read a paper on the *Technique of Tenotomy*, urging the importance of thorough asepsis in all details. In planning the operation one must consider the weakened power of the muscle operated on, the muscular force of its antagonist, and the elasticity of the tissues—factors which vary greatly in individual cases. The operation should be planned to leave slight convergence immediately after tenotomy of the interni or externi, and to slightly undercorrect vertical squint.

Dr. S. Theobald, of Baltimore, called attention to the slight effect sometimes obtained as the result of free tenotomies of the ocular muscles for heterophoria (insufficiency). No comprehensive and satisfactory explanation of this fact had yet been offered; and the most experienced operator could not say with any assurance just what the effect of a

given amount of cutting would be. The matter is, however, one as to which we are not wholly in the dark. The smaller the eye-ball, and perhaps the more deeply-seated, the less will be the effect of the division of one of the muscles. Tenotomy for the correction of actual squint produces a relatively greater effect than for heterophoria. Tenotomy on a slender internus causing intermittent convergent squint has more effect than on the well-developed muscle usually found with fixed convergence. While in squint we expect more effect from tenotomy of the internal than of the external rectus, the most striking instances of slight effect that he had met were all cases of tenotomy of the internal rectus for esophoria (insufficiency of the externi).

Dr. H. F. Hansell, of Philadelphia, discussed the limitations of the application of tenotomy of the ocular muscles. In convergent squint, if concomitant or alternating, after the careful correction of errors of refraction he finds tenotomy, equally divided between the two muscles, the proper procedure. In fixed monocular squint tenotomy is unavailing without advancement of the externus of the squinting eye. In divergent squint tenotomy is objectionable as weakening normal muscles instead of strengthening those which are abnormally weak. Advancement of the interni with correction of any myopia should be preferred. In constant vertical squint tenotomy of the superior rectus is often necessary. For heterophoria (latent squint) the same principles apply as for the actual turnings of the eye.

Dr. G. C. Savage, of Nashville, described the indications for, and the advantages and technique of muscle shortening. It was indicated in all cases of heterophoria. In low degrees of squint alone, and in the higher degrees in connection with tenotomy it would give the best results. It is done by making an incision beneath the lower border of the tendon, through the conjunctiva and capsule. The tendon is raised on two strabismus hooks. A needle is passed through the conjunctiva and tendon at the upper border of its insertion, carried back beneath the tendon to the point chosen in its upper margin, and brought out

through tendon and conjunctiva. It is then re-entered through the puncture in the conjunctiva, carried between the conjunctiva and capsule to the first incision, and there at the point chosen made to pierce the capsule and tendon from without inward. The suture thus placed is then drawn up, causing the folding of the included part of the tendon, and by so much shortening it. The suture is left in four or six days, and the loop of tissue thus formed gradually atrophies.

Dr. G. T. Stevens, of New York, thought that free tenotomies have slight effect only when the muscle operated on is not the muscle at fault. Lateral deviations were very often the effect of fault of tension in the vertically acting muscles, and the tension of these should be investigated before any operation was done on the lateral muscles. To study these tensions he had devised what he called a tropometre, a telescope with a scale in the eye-piece on which the eye movements could be accurately measured. The normal upward rotation was 40 or 45 degrees, the downward 50 or 55 degrees. When the upward rotation was materially deficient and the downward in excess, the upward rotation should be brought to 40 degrees before operating on a lateral muscle. If the rotations in all directions are evidently too great, tendon shortening may be resorted to; if the sum of the rotations is not excessive tenotomies alone are called for.

Dr. Hiram Woods, of Baltimore, had found that recently suggested systems of muscular exercise could to some extent displace tenotomy in the treatment of heterophoria, but that the ideal treatment that can be depended on to develop weak muscles to the strength of their antagonists has not yet been discovered.

Dr. J. W. Park, of Harrisburg, urged that cases of insufficiency of the ocular muscles should be watched for one or two years before tabulating their results for publication. Cases of insufficiency of the recti with hyperopia generally do well with correction of their refractive errors, muscular exercises, outdoor life, tonic treatment, and the temporary use of prisms. With myopia prisms are more constantly

required, and operations more effective than with hyperopes. Tenotomies are not necessary in most cases, and should not be done until all other remedies fail.

Dr. E. J. Bernstein, of Baltimore, had seen three cases of paralysis of the superior rectus alone, and questioned if such cases were as rare as was generally supposed. He believed they might arise from a lesion of the nerve twig supplying this muscle, just as do isolated palsies of single pairs of muscles in the larynx.

Prevention of Blindness from Ophthalmia Neonatorum.—Dr. Lucien Howe, for the Committee appointed two years ago to urge legislation requiring that every case of inflamed eyes in an infant should be promptly reported to a competent physician or health officer, reported that the co-operation of various local medical societies had been secured, and that such legislation had been secured in six States, in addition to the three that had such laws previously. The Committee was continued.

Ectopia Lentis.—Dr. F. B. Tiffany, of Kansas City, reported seven cases occurring in one family of nine children. The father was said to have had defective eyes. The defect was in each case bilateral. The displacement was in one eye outward and very slightly downward, in another case it was in one eye upward and inward; in a third case it was in both eyes almost directly inward, in all the other eyes it was upward and outward. The two children not thus affected had full vision but were hyperopic 3D.; and one had persistent medullary sheath in the left eye. In point of age the children with normal lenses were the second and eighth.

Enchondroma of the Cartilage of the Upper Lid.—Dr. P. D. Keyser, of Philadelphia, reported a case of such a growth. In 1888, a woman, aged 58, had consulted him for a round hard lump in the upper lid, firmly attached to the cartilage, which had been growing for a year or two. An incision was made over the tumour, and the convexity shaved off. In 1890 she came back with a much larger return of the growth, which was treated in the same way. In 1892 the

growth had recurred and was more nodular. The edge of the lid was slit and as much of the cartilage as was possible was removed, leaving the conjunctiva. In six or eight months it began to develop again rapidly. In September, 1894, the growth consisted of two large nodules with a small open sore at the edge of the lid. The edge of the lid was carefully slit and the skin dissected up so as to expose the whole growth. The whole cartilage of the nodule on the nasal side was removed with the conjunctiva, while that of the temporal side was dissected out as much as possible, leaving the conjunctiva. A microscopic examination of the growth was now made, and showed it to be an enchondroma. A careful examination of the literature at hand failed to show a report of any case of the kind, although Fuchs, and others following him, stated that such a growth of the lids might occur.

Formalin as a Preservative Agent.—Dr. Hotz showed for Dr. W. H. Wilder, of Chicago, some specimens of the eye-ball preserved in formalin. Dr. Wilder used it in 5 per cent. solution, and found the eye in a few days hard enough to bisect. For microscopic specimens mounted in glycerine jelly, in the manner described by Priestley Smith (Ophthalmic Review, 1883, p. 69), he found that exposure of the mount to the vapour of formalin under a bell glass for twenty-four hours hardened the jelly so that it would not soften on exposure to the temperature of boiling water.

Anæsthesia by Infiltration.—Dr. H. V. Würdemann, of Milwaukee, called attention to the method of Shleich of producing anæsthesia by injection of water or solutions into the skin instead of beneath it. Solutions of cocaine injected hypodermically must have a strength of at least 2 per cent. to secure anæsthesia, and on account of the amount required for any considerable operation such a solution was more dangerous than the use of ether or chloroform. Shleich found that when thrown directly into the skin pure water caused complete anæsthesia, but the injection itself was very painful. The injection of a normal salt solution was painless but caused no anæsthesia. With

a weaker salt solution good anæsthesia was secured, without causing much pain. The efficiency of the solution was increased, however, by the addition of very small quantities of morphine and cocaine. The following proportions were best for most operations : morphine hydrochlorate, one-fortieth of 1 per cent. (·00025) ; cocaine hydrochlorate, one-tenth of 1 per cent. (·001) ; sodium chloride, two-tenths of 1 per cent. (·002) in distilled water. Strict antiseptic precautions should be observed, and the solution should be as cool as possible when injected. The injection of a drop or two of this directly into the skin caused the immediate appearance of a white slightly elevated weal which was completely anæsthetic. To extend this the needle was withdrawn from the centre and inserted just within the margin of the weal, where the injection of a drop or two more caused a second weal. The next injection was to be made at the margin of the last weal, and this continued until the anæsthetic area was sufficiently extended. Only the tissue directly infiltrated was rendered anæsthetic. The first injection might be rendered painless by touching the skin with carbolic acid or numbing it with cold. Where subcutaneous tissues were to be involved in the operation these were infiltrated through the anæsthetised skin. The method had proved very satisfactory for the various operations upon the lids. Dr. Würdemann demonstrated the method by producing complete anæsthesia for the removal of two sebaceous cysts from the forehead, and the insertion of eight stitches required to close the wounds.

Examination and Care of Eyes during School Life.—Dr. Randall, Chairman, reported for the Committee on this subject, favouring, as a minimum examination that would be satisfactory and efficient, one which included the objective evidences of inflammation of lids, conjunctiva, cornea and tear-passages, squint, photophobia, &c. ; the visual acuity, choice of astigmatic lines, near point, muscle balance, colour sense, the refraction by retinoscopy and direct ophthalmoscopy, with notes of the eye-ground con-

ditions. A concise untechnical statement of the results of such examination should be reported to the school authorities, who might transmit it to the parents. Part of the work could be done by instructed laymen, leaving the time of the Examiner-in-Chief for strictly expert procedures. In this way from twelve to twenty could be examined in an hour. Such work should be compensated, though at first the compensation would necessarily be small. Such a plan of examination had been carried out in some of the schools of Philadelphia.

Importance of Minor Choroiditic Changes.—Dr. B. A. Randall, of Philadelphia, called attention to the practical importance of a careful study and record, either verbally or by sketches, of the slighter alterations of the eye-ground, especially conus. The lack of familiarity with the more common of them had led to hasty generalisations, some of which were instanced. To the question, why should we do this habitually when the famous European clinicians and teachers of ophthalmology did it only in exceptional cases, he would reply with the question: Why, when the ophthalmic world regarded myopia as usually progressive, were progressive cases rare in the practice of the over-minute Americans?

Statistics of Errors of Refraction.—Dr. H. B. Ellis, of Los Angeles, had tabulated the results obtained by the examination of 1,700 eyes of patients with errors of refraction, as to the error present, its degree, the direction of the axes of astigmatism, and the frequency of various ocular and other symptoms. Of ocular symptoms the most frequent was distress from reflected light, which occurred in 28 per cent. of all cases. Of other symptoms headache was the most common, occurring in 31 per cent. of all cases.

Drs. S. D. Risley and James Thorington, of Philadelphia, reported statistics of the kind and degree of refractive error in the eyes of 2,500 patients, with the direction and symmetry or asymmetry of the meridians of astigmatism. They found the meridians of astigmatism symmetrical in

1,307 and asymmetrical in 458 cases. In 173 cases the meridian of greatest curvature was in one eye at 0° and in the other eye at 90°; and in 41 cases the meridians of the two eyes were parallel, but not vertical or horizontal.

Latent Astigmatism.—Dr. H. M. Starkey, of Chicago, found latent astigmatism was a frequent and important cause of asthenopia, and had not received the attention it deserved. It could be rendered manifest without the necessity of employing a mydriatic, by letting the patient wear the correction for the manifest error, and changing the glasses from time to time as more became manifest.

Conditions that change Corneal Curvatures.—Dr. L. J. Lautenbach, of Philadelphia, included as influencing the form of the cornea, the muscles of the eye and lids, orbital resistance, and intra-ocular pressure. Any interference with the balance of these forces results in astigmatism. If the cornea be healthy its shape changes slowly, if it be weak it may change rapidly. Conditions interfering with corneal nutrition predispose to such changes; and study of the corneal changes will throw light on otherwise obscure conditions, including affections of the eye muscles.

Anomalous Cases.—Dr. A. C. Corr, of Carlinville, Ill., reported a case of congenital interstitial opaque infiltration of the cornea, improving greatly with the development of the child, so that at the age of 19 months there remained only a nebula. He also reported a case of maternal keratitis, recurring twice in successive lactations, and cases of orbital bone encapsuled in the globe for two and a half years, of severe hæmorrhage from the iris as the result of a small iridectomy in cataract extraction, and a case of calcareous lens occluding the pupil and afterwards becoming detached and requiring removal.

THE GLANDS OF THE CILIARY BODY: A REPLY TO SOME RECENT CRITICISMS CONCERNING THEM.

By E. Treacher Collins, F.R.C.S.

In 1891 I published in the *Transactions of the Ophthalmological Society* a paper entitled, "The Glands of the Ciliary Body in the Human Eye." In it I described the arrangement of the pigment epithelium of the ciliary body as seen in bleached sections. I pointed out that, protruding from the pigment epithelium towards the ciliary muscle, were numerous little processes each composed of a group of cells, which I found on transverse section to be tubular, and which I could imagine to be nothing else than glands concerned in the elaboration of the aqueous humour and nutrient fluid of the vitreous.

The present article is a reply to certain criticisms which have since appeared concerning these structures which I called glands.

First I should like emphatically to state, that in speaking of glands of the ciliary body I do not refer to the recesses between the ciliary processes or any of their convolutions, as Greef and others seem to have thought, but to definite outgrowths of cells from the pigment epithelial layer only.

Ophthal. Review, Vol. XV., No. 173, March, 1896.

Griffith in commenting on them remarks :—" With so many fallacies and pitfalls, can we in safety acknowledge the existence of any true glands ? Certainly we may : the tubular and pyriform glands described by Collins as existing at the junction of the plicated with the non-plicated portions of the ciliary body are true glandular structures, though not many in number or very large in size. They are cellular outgrowths from the pigment epithelium, are flask-shaped or *tubular, containing a lumen*.[1] Similar glands are seen between the ridges, and one or two in the pars non plicata."

It will be seen from this that Griffith confirms my observation as to the presence of tubular glands in the ciliary body, though he does not seem to think they are as numerous as I have described, for further on he states that he finds only two or three glands in a single section.

Alt agrees with me that the processes of cells projecting from the pigment epithelial layer are very numerous, and he gives several reproductions of photomicrographs showing them. He says :—" In almost every section of the ciliary body, whether meridional or equatorial, whether from the newly born or the adult, whether from a blue or a brown eye, whether from a normal or a pathological eye (in which the tissues concerned have not been destroyed by the pathological process), a varying, *but always comparatively large, number*[1] of small tongue-club- or pear-shaped projections from the outer surface of the pigment layer can be found. In some sections these projections are larger than in other specimens, and sometimes they are apparently wanting."

He has, however, unlike Griffith and myself, been unable to satisfy himself as to the tubular character of

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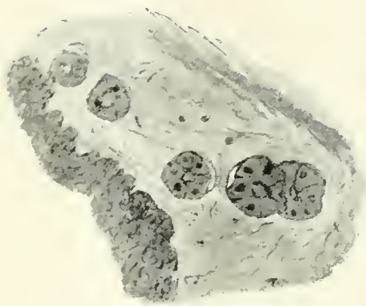
[1] The italics are mine.



Drawing showing Transverse Section of the Glands of the Ciliary Body.

the processes. He says:—"I cannot find a single one in my very large collection of sections, pigmented or bleached, stained or unstained, which shows a lumen. They are all simply pegs of cells projecting outward from the pigment epithelium layer."

This is, of course, a very important point, and one which forms the connecting link between these processes and the pathological overgrowth of a gland-like tissue in cyclitic membranes, and the carcinomatous tumours arising from the ciliary body.

It may be that Alt has not examined bleached sections of the glands cut transversely; he mentions meridional and equatorial sections of the ciliary body, but does not say that he has prepared any cut on the flat. It was from sections so prepared—as I mentioned in my article—that I was able so confidently to assure myself that there was a central lumen to these projecting cell processes. I give a drawing of the appearances shown in such a specimen.

In longitudinal sections of the cell processes, I admit, it is often not easy to make out any lumen, but some of them can be seen to be distinctly composed of two parallel rows of cells, between which presumably the lumen lies. Alt apparently has recognised the occurrence of parallel rows of cells in some of them, for he quotes a paragraph of my original article where I have described them, and agrees that the description is correct.

Griffith considers some of the processes of cells which project outwards from the pigment epithelial layer in the non-plicated part of the ciliary body, to be rucks caused in it by contraction of the ciliary muscle, comparing them to the creases which occur near the root of the iris on its posterior surface. In making the comparison, however, it must be borne in mind that the creases at the back of the iris are in the inner layer of pigmented cells—what corresponds to the inner layer

of the secondary optic vesicle; while the projections in the non-plicated part of the ciliary body are in what corresponds to the outer layer of the secondary optic vesicle. Moreover, the projections in the iris are directed inwards, those of the ciliary body outwards.

I certainly have failed to find what I described as the posterior group of glands—those situated just in front of the ora serrata—in some sections from perfectly healthy eyes, but it does not necessarily follow that they were absent in the whole circumference of the ciliary body from which these sections were taken. In sections of other healthy eyes prepared in a precisely similar way and removed under similar circumstances (viz., on account of orbital growths) they are present as I originally described them. Their appearance does not suggest that they are rucks of the pigment epithelial layer caused by contraction of the ciliary muscle. They are directed somewhat backwards as well as outwards, they are broader than the processes of cells in the anterior group, and can be more definitely seen to be composed of two parallel rows of cells. I have failed to detect any appearance which could be considered a half-stage between one of these tubular processes and a single row of cells, as might be expected were they caused by contraction of the ciliary muscle.

Griffith occupies a large part of his paper in showing that the glands cannot be the sole source of the aqueous humour, and that the epithelium covering the ciliary processes must be in part concerned in its secretion. I never asserted the former or denied the latter. I collected evidence showing that the epithelium of the ciliary body was the source of the intraocular fluids; I then pointed out that projecting from the pigment epithelial layer were numerous little tubular processes, and I said the inference that they were concerned in the elaboration of the fluid secreted

in that region was irresistible, and so I still consider it to be.

That the pigment epithelial cells covering the ciliary processes also take an active part in secretion is highly probable. I have always spoken of the pigment tubular processes as the glands of the ciliary body, never being so presumptuous as to term them even the glands of the aqueous humour, as others have done, and as others have accused me of doing.

In certain inflammatory conditions of the uveal tract, the pigment epithelium lining it proliferates, the newly formed cells always tending to grow inwards—never outwards—into the choroid, ciliary body or iris ; presumably they grow in the direction of least resistance. When the pigment epithelium lining the choroid proliferates, it invades the retina, or if the retina is detached it extends into the sub-retinal fluid. The pigment epithelial cells lining the iris when they proliferate are either carried forwards into the aqueous, or if, as often occurs when such proliferation takes place, there is an accumulation of plastic inflammatory exudation between the iris and lens, they grow into that. In the case of the ciliary body the same occurs, the proliferated epithelial cells are sometimes carried forwards into the aqueous, or they grow into a mass of inflammatory exudation on its inner surface. This inflammatory exudation on the inner surface of the ciliary body becomes organised into fibrous tissue, and forms what is known as a cyclitic membrane.

Now, though proliferation of the pigment epithelium of the choroid, ciliary body and iris, occurs under similar circumstances, it is only in the region of the ciliary body that the new formed epithelium ever takes on the character of tubular glandular processes. These tubular processes, moreover, seem always to start either from the junction of the plicated and non-plicated

parts of the ciliary body, or from just in front of the ora serrata—that is to say, they start from those regions in which I find normally tubular processes to be largest and most numerous.

The condition is, I think, comparable to what is found occasionally on the inner surface of mucous membranes resulting from chronic inflammation, and which is described by Ziegler in his "General Pathological Anatomy" as follows :—

"We must regard in the same way the tumour-like growths which occasionally develop in mucous membranes chiefly as the result of chronic inflammations. They are mere localised proliferations, rising above the general surface as nodular, polypous or papillary outgrowths. The fibrous tissue is the first to increase, and this leads to some increase of the epithelium, chiefly because the local sub-mucous swelling involves an increase of the mucous surface. If any glands are present (as in the intestine or uterus), they also undergo change. If their ducts become blocked they may become distended with secretion, and form large or small cysts. Other glands may enlarge by increase of their stroma, and lastly there may be in some an active growth and increase of the specific gland-tissue."

In the case of the new formed gland tubes in cyclitic membranes, there would be no outlet for their secretion ; they would, therefore, become dilated, and their tubular character would consequently be more obvious than in the glands in the normal condition. Cysts of the ciliary body due to separation of the pars-ciliaris retinæ from the pigment epithelium are not uncommonly met with in eyes which have had cyclitis. I have met with one specimen in which apparently there were cysts due to the distension of some of the glands ; it was an eye which had had cyclitis, and the cysts were bounded entirely by pigment epithelial cells.

I quite agree with Alt that whoever has seen the tubules in cyclitic membranes, which he was the first to describe, "cannot possibly accept Griffith's idea, that we have to deal with newly formed lymph channels congested with leucocytes, performing a useful work in clearing away the melanotic *débris* of disintegrated pigment cells from the site of the recent inflammatory battle—in other words, a process of phagocytosis."

The number of cases of primary new growths of the ciliary body of glandular or carcinomatous structure goes on accumulating. When I recorded my first case, the only other one I knew of was that pictured by Alt. I later on found one described by Michel in 1878. In March, 1892, Badal and Lagrange described and pictured the microscopical sections of a primary carcinoma of the ciliary body. In 1893, Mr. Rockliffe of Hull sent me an eye he had removed for a tumour of the ciliary body which was undoubtedly primary, and which I found on microscopical examination to be a carcinoma. Last year Mr. Robertson of Glasgow recorded in this journal[1] a case of carcinoma involving the iris and ciliary body. The author considered the tumour to have originated in the iris; the reasons he gives for doing so do not seem to me very conclusive, and it must necessarily be an exceedingly difficult point to determine. It is certainly a very suggestive fact, that now so many growths of a glandular carcinomatous character are on record which have primarily involved the ciliary body, and that none have been found arising primarily in the choroid, which is more prone to other forms of tumour than the ciliary body.

Griffith, in a short paragraph at the conclusion of his paper, advances a new theory with regard to the function of the glands of the ciliary body. He says: "It strikes me forcibly, as highly probable that they (the

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[1] OPHTHAL. REVIEW, vol. xiv., p. 374.

glands) control the amount of pigment in the eye and regulate it as nature demands." The evidence he brings forward in support of this theory is, (1) that he has found the glands to be more numerous in brown eyes than in blue eyes. Alt has, however, found them to be very numerous in both brown and blue eyes: (2) that the glands are not present in albino rabbits' eyes. I have bleached sections of pigmented rabbits' eyes, and found, as in the albino rabbit, that no glands were present.

In conclusion, let me add a few words with regard to the method of bleaching sections of the eye.

Griffith says he has "On several occasions attempted my method without success," and describes a new one of his own which he considers decidedly better.

Alt says, "I have also tried Griffith's and other methods suggested by my friend D. O. Curtmann, Professor of Chemistry, Missouri Medical College, yet I have always returned to Collins's method, now and then slightly modified." He adds, however, "when reading Collins's description of it, this seems to be a very simple affair, yet I have found it to be quite different."

Why anyone from reading my description of the bleaching process should have thought it a very simple affair I cannot understand, because I expressly stated, "The manipulation of the sections requires considerable care, as after exposure for some time to the chlorine they have a great tendency to come to pieces, the substance of the cornea peeling off Descemet's membrane, the choroid separating from the uveal pigment layer of the retina, and so forth, in spite of the embedding celloidine. In fact, it is not easy to get a perfect section first bleached and then stained."

I may add that I have now instructed many students in the process, who with supervision have been able to carry it through successfully and obtain satisfactory specimens.

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TWO CASES OF SYMBLEPHARON,

WITH REMARKS ON SOME NATIVE EGYPTIAN METHODS OF EYE-TREATMENT.

By KENNETH SCOTT.

THE following two cases are instructive, as showing the amount of harm which may be done by the unskilled application of caustic remedies to the eyes, or on the other hand, what may be the result of their use in too concentrated a form.

One of the patients was a boy, 14 years old, in whom both eyes were affected and presented an almost exactly similar appearance. When the eyes were in a state of rest, the upper eyelids seemed to droop a little more than was natural ; when he tried to glance sideways, the movements of the eyes were greatly

restricted, and a good deal of dragging on the upper eyelid was evidenced; he was unable to rotate the eyeball downwards further than the central point of vision-fixation. On closer examination, the lid was found to be firmly bound down in its whole length to the upper two-thirds of the cornea and entirely covering the pupil, even when semi-dilated. The boy could only see objects on the ground directly in front of his feet, and that only imperfectly. His eyes had been in this condition since very early childhood.

I operated on him under chloroform and found that the adhesion was restricted entirely to the upper two-thirds of the corneal surface and the opposing portion of conjunctiva of the upper eyelid; there was no adhesion between the opposing surfaces of the ocular and palpebral conjunctivæ in the upper fornix. In dissecting the adhesion off the surface of the cornea, I also removed some of the superficial corneal epithelium, in order to avoid as much as possible the after-occurrence of thick nebulæ, which would naturally result from the cicatrised *débris* of any extraneous tissue left. The remainder of the palpebral conjunctiva was then freed from its eyelid as far back as possible into the fornix, and brought down to the eyelid margin, being secured there with a continuous silk suture. A bandage was applied for twenty-four hours only, and atropine was regularly instilled until the corneal surface had healed.

I afterwards operated on the other eye, and found the condition there was exactly similar to that in the right eye. Both eyes made a good recovery, and when he was discharged five weeks later, both corneal surfaces were free and only faintly nebulous, with the pupil aperture of each iris perfectly distinct. The eyes were freely mobile in all directions, and vision was practically normal.

The other patient, a girl of 12 years old, had her right eye affected in an almost similar manner, but in her case the adhesion extended lower down over the cornea than in the boy, and when operated upon was found to be confined to the central area of the cornea where it masked a large dense central leucoma. Exactly as in the boy's case, this adhesion restricted all movements of the eye, except that upwards. When the girl was discharged, her eyelid had recovered from its slightly drooping position and all eye-movements were free; her vision, however, remained imperfect, owing to the central leucoma, and also to a divergent strabismus which was present in the affected eye.

The history of both these cases was exactly the same. When very young, each of them had inflammation of the eyes, which was treated by their respective mothers with collyria of "dowa hamya" (*Arabic*, "burning medicine"). The general belief amongst the numerous poorer class natives of Egypt is, that no benefit will accrue from the application of medicaments to the eye unless pain or irritation is at the same time produced. This class of people extensively use a dry collyrium called "sheeshm," which is always in the form of a powder, and is applied directly to the eyeball. There are two varieties of "sheeshm" which are most commonly used: one of these is "white sheeshm" and is composed of powdered alum, calomel, sugar and flour; the other variety, called "yellow sheeshm," has much the same composition, but with the addition of ginger and cayenne-pepper.

I have also not unfrequently seen poor patients coming from the provinces, or towns, with their eyes in a very bad state, owing to their having used dry slaked-lime as a "sheeshm" or eye application, thus destroying the eye, or rendering it practically useless.

The two orthodox "sheeshms," until within the last

two years, were made up in large quantity annually, and then put into thousands of small round tin canisters and sold, or distributed as an act of charity to the public.

There are other preparations called "tóotyă," which are also applied to the eyes, but only externally, over the outside of the eyelids. According to observed tradition, these when required, must, unlike the "sheeshms," always be prepared freshly. There are four varieties of them commonly employed; "blue," in which sulphate of copper predominates; "red," which contains the red oxide of mercury; "white," which has both oxide and sulphate of zinc in it; and "black," which contains black sulphide of lead, pepper, &c. When these remedies are used, they are copiously smeared over the outside of the eyelids and along the eyelashes, and are intended to benefit the eyes or eyesight.

Again, amongst soldiers who wish to malinger and escape doing duty, it is not uncommon to find the cornea and inside of the eyelid violently inflamed and ulcerated, owing to the fact that the man has introduced a small piece of solid nitrate of silver under the upper eyelid. With a similar purpose they also use the ground-down seeds of a plant called "mĕloochéeyă," a small herb largely used as a vegetable; its proper name is *Corchorus olitorius;* it is one of the *Tiliaceæ,* a sub-order of the *Maloaceæ.* This powdered seed induces an intensely acute, semi-purulent, catarrhal conjunctivitis, accompanied by destructive ulceration of the cornea.

In addition to the fore-going direct methods of causing damage to the eyes, there are some curious customs observed by the same class of people, which not infrequently give rise to inflammation producing such effects that vision is permanently interfered with, or the eye even totally disorganised.

Newly-born children are never washed or cleansed with water in any way until they are two years old. Other customs which often prevent children being properly treated and attended to, and their eyes being saved before any serious involvement of tissues has occurred, are expressed in some such sayings as the following, which are observed, with but few exceptions, by all the poorer class of peasants and other natives, and in some cases also by people of the better classes too.

"The best treatment for the eyes is not to treat them at all."

"If the eyes are bad, wait seven days before doing anything, because if it is the will of God, they will be better in that time; if, after seven days the eyes have not recovered, it is useless to do anything, for it is plainly God's will that they shall not recover," and so on.

On questioning native Egyptians who have damaged eyes, as to how long they have been so, the answer is nearly always the same; "Ever since I was quite a small child," and to the best of my belief this is in great part true.

It is to the fatalistic and careless neglect of eyes, over which no amount of argument seems to prevail, and also, to ignorant self-maltreatment, that the lamentable condition of so many Egyptian eyes is due.

MITVALSKY (Prague). Orbital Thrombo-Phlebitis. *Arch. d'Ophtalmol., January*, 1896.

In this valuable "contribution to our knowledge" of orbital phlebitis of thrombotic origin, the author gives in great detail the results of his own observation of two cases in their clinical and pathological aspects. He does not claim to have added much that is new to the clinical picture of this malady, but has devoted his attention particularly to the microscopic pathology and bacteriological examination. In this direction new facts could not fail to come to light, for opportunities such as have occurred to him have been perhaps hitherto unknown; certainly no such systematic microscopic and bacteriological examination as this has been recorded in connection with phlebitis of the orbit.

The notes of the author's two cases, much curtailed, are as follows:—

Case 1.—B. W., aged 56, hawker, admitted to hospital November 10, 1891. He had always enjoyed good health. A fortnight before admission symptoms of acute tonsillitis began; the attack was accompanied by high fever, constipation, and subsequently diarrhœa. On admission the conditions were, periostitis of the left inferior maxilla and phlegmonous infiltration of the left parotid region extending also forward along the jaw, well marked trismus, great fœtor of breath, and a gangrenous tonsillitis on the left side, not easily seen on account of the tetanus. Spleen considerably enlarged, urine normal, temperature 40° C. Nothing abnormal detected in the eyes; visual acuity good.

On November 12 the patient stated that his right eye had become blind during the night. There was slight exophthalmos on the *right* side, œdema of the upper lid and pale chemosis, chiefly of the lower outer part of the conjunctiva. The fundus oculi appeared slate coloured, the retinal veins were dilated, rather tortuous and very dark, the arteries scarcely visible. No hæmorrhages were seen.

On the morning of November 13 the left eye was in a

similar condition, and blindness was complete. The man died at midday on the 13th, and about two hours previously Mitvalsky noted moderate œdema of upper eyelids, chemosis of the conjunctiva of the right eye, which was proptosed, but its movements active and passive, very little impaired; the pupil of this eye half wide and inactive to light. The media were clear, and ophthalmoscopic examination, though difficult, was practicable, and revealed disseminated retinal hæmorrhages. The extraordinary venous stasis was probably present in the choroidal as well as in the retinal veins, and gave rise to the slate colour of the fundus, a tint much darker than the complexion and hair of the patient suggested as normal. The optic papilla appeared of a deep brown colour, and its margin was ill-defined. The exophthalmos on the left side was less in degree, in other respects the conditions of the eye were similar to those of its fellow, retinal hæmorrhage being easily distinguishable.

The following interpretation of the clinical features is given by the author. In the course of a gangrenous tonsillitis, infection in the form of a purulent infiltration spread along the periosteum of the inferior maxilla externally, to the parotid region, and along the lateral walls of the pharynx to the base of the skull; from this point extension along small veins to the cavernous and other basal sinuses took place, and thrombosis of these sinuses occurred. By way of the ophthalmic veins inflammation travelled to the orbit, and there set up a thrombo-phlebitis. Death was caused by meningitis and septicæmia.

The *post-mortem* examination confirmed this diagnosis. The left tonsil was especially the starting point from which infection spread; the body of the sphenoid bone was infiltrated with pus, and the infiltration extended to the anterior cerebral sinuses, which were partially thrombosed and their walls inflamed.

In the gangrenous tonsil numerous micro-organisms, especially streptococci, were found.

The contents of both orbits were removed for examination. The ocular symptoms (chemosis, exophthalmos,

blindness) had been manifest in the left eye for only six hours, and in the right eye for thirty hours before death; the author consequently was in a position to ascertain the early anatomical changes in phlebitis and thrombosis of the orbit.

Left orbit.—Œdema of the cellular tissue was obvious; the chief change, however, was in the large orbital veins and their principal branches; most of these were empty or contained merely some thin clots; their walls were thickened and inflamed. Their course, and especially that of the superior ophthalmic vein and its branches, was marked by numerous miliary hæmorrhages, situated in the middle and outer coats of the vessels, and evidently due to rupture of the *vasa vasorum.*

The internal coat of the veins was inflamed, and showed numerous small white fibrous-looking excrescences; in places grey or greyish-red thrombi, which, however, at no point filled the vessel, were found in the larger veins; the smaller branches were completely blocked by thrombi, and in section appeared as small greyish solid cylinders.

Right orbit.—The conditions above described were more apparent, the œdema of the cellular tissue was greater, the changes in the large and small veins precisely similar to those in the left orbit.

Portions of the thrombi were examined fresh for micro-organisms, and the diplococcus of Fränkel-Weichselbaum was discovered.

The rest of the specimens were hardened in Müller's fluid, and subsequently examined in section. The results of this examination are given *in extenso* by the author; but a brief abstract must here suffice.

In the *left orbit* (which was affected six hours before death) changes were present in nearly all the veins. The terminal branches were engorged, cylindrical on section; numerous hæmorrhages had occurred from them. In many there were collections of white blood corpuscles, sometimes in the centre of the blood channel, sometimes at the periphery, and occasionally filling the vessel. The white cells also showed vacuolation and other signs of

degeneration in places, whilst in other parts there was evidence of rapid proliferation. Signs of inflammation of the thrombi were recognised. Some of the thrombotic masses were purulent and contained innumerable microbes. These, which are figured by the author, were considered by him to be identical with those he found in the fresh specimen, viz., the pneumonic diplococcus of Fränkel-Weichselbaum.

In the larger veins there were purulent thrombi containing microbes. The veins of medium size were completely blocked by thrombi; the principal venous trunks were only partially so. The superior ophthalmic vein in almost its whole length was practically empty, but near the posterior pole of the eye was blocked by a septic thrombus. The inferior ophthalmic vein contained larger masses, although in no part was the vessel completely plugged. The same diplococci were found in the thrombi, but they were comparatively much less numerous than in the smaller veins.

Examination of the condition of the walls of the veins showed that there was no constant relation between the site of the thrombi and that of the changes in the coats of the vessels. Where the thrombi were purulent the endothelium of the veins exhibited marked alteration, swelling, proliferation, and often separation from the subjacent layer. But in other parts the wall of the vessels was inflamed, while the blood coagulum showed no pathological changes. In some of the small veins, purulent thrombi were found, and a plastic, purulent inflammation of the vessel walls, spreading to the surrounding cellular tissue, and accompanied by numerous hæmorrhages. The author formulates a law that the condition of the thrombus being the same, the inflammation of the wall of the vein is in inverse proportion to its thickness. The veins with delicate soft walls show a greater tendency to become inflamed than those with thicker, more fibrous coats.

The superior ophthalmic vein showed changes in its endothelial lining which differed from those found in the other orbital veins; these consisted of considerable aggregations of small cells which stained very deeply; they

were attached to, and undoubtedly resulted from proliferation of, the endothelium. These cell collections, of which the writer gives a drawing, were found only in the superior ophthalmic vein; they bore no apparent relation to the micro-organisms present in the tissues.

The pathological changes in the trunk of the superior ophthalmic vein differed from and were much less noticeable than those in its minute ramifications, the latter being for the most part filled by septic thrombus, and their walls and the adjoining tissue being the seat of purulent or plastic inflammation.

An acute phlebitis was evident in the inferior ophthalmic vein, and it and its branches contained numerous thrombi packed with microbes, generally purulent. The central vein of the retina in the greater part of its extra-ocular course was thrombosed, its walls inflamed, but in the middle portion of the optic nerve it exhibited no changes.

The arteries of the orbit were, for the most part, empty; the nerves showed no alteration in structure.

In the *right orbit*—in which signs of disease had existed for thirty hours—the conditions found were similar, but in a more advanced stage. Bacteriological examination revealed the pneumo-coccus of Fränkel-Weichselbaum in large numbers, as in the tissues of the left orbit.

Case 2.—B. J., age 24, a robust, well-nourished labourer, was admitted to hospital September 21, 1889. Three days previously, while at work in the fields, he suddenly perceived that his "left eye was swollen and becoming painful." Towards evening of the same day he had severe rigors, which continued till admission. During the next few days the swelling increased, severe headache and diarrhœa ensued. When first seen at the *clinique* he was apathetic, temperature 40·5° C., pulse 110, tongue coated, spleen enlarged. The right eye was in every respect normal. On the left side there was extreme proptosis, swelling of eyelids, which were livid, and very tense, and inflammatory chemosis. There was some downward displacement of the eye; its movement upwards was abolished and that in other directions greatly limited. The cornea

was transparent and sensitive, pupil of medium size and reacting slowly to light. The fundus differed from that of the fellow eye in that it was slate-coloured, and the optic disc of a deep brown tint; the retinal veins were much dilated, almost black, and slightly tortuous; the arteries were shrunken. There were no retinal hæmorrhages. Vision in this eye was apparently not much diminished.

September 23rd.—Paresis of left facial nerve; enlargement of liver and spleen.

September 24th.—An eruption of large papules all over the body, diagnosed by a dermatologist as *urticaria gigantea*. Spasmodic twitching of hands. Complete paralysis of facial nerve. Left pupil larger but still reacting slowly to light.

September 25th.—Urticaria disappeared; signs of œdema of lungs; albuminuria, coma, and death.

The diagnosis was thrombotic inflammation of intracranial sinuses and thrombotic phlebitis of the left orbit, followed by septicæmia and meningitis. The author considered the orbital disease as the primary lesion.

The cadaver was examined two and three-quarter hours after death, and the following conditions discovered:—purulent basic meningitis; purulent thrombi filling the left petrosal and almost the whole of the circular sinus, with partial destruction of their walls. The thrombosis extended along the left ophthalmic vein into the orbit, and as far as the junction of the right ophthalmic vein and cavernous sinus. The autopsy revealed ample evidence of an acute blood poisoning with metastatic abscesses in the lungs, spleen and kidneys. Careful examination of the cavities of the mouth, nostrils, pharynx and neighbouring spaces, gave no clue as to the source of infection.

The contents of the right orbit were healthy. Those of the left orbit were removed *en masse*, and hardened in Müller's fluid for microscopic examination, with the exception of a few fragments taken for immediate bacteriological investigation. The latter examination was carried out three hours after death, and included purulent thrombi

from veins and cerebral sinuses, pus from the meninges, and from a metastatic abscess; the staphylococcus pyogenes was found in abundance in this material, and was also discovered in blood taken from the corpse.

Examination of the orbital tissues, after hardening, showed that all the venous channels in the orbit, except the capillaries, from the optic foramen forwards, were transformed into purulent tubes, often of larger size than the healthy veins, and in places dilated to form cavities containing pus. The most important changes in the walls of the veins were in those of large size (those of the *first* and *second order* according to the writer), although inflammatory signs were visible in veins of all sizes. In sections of many of the larger veins the wall had almost entirely disappeared, in others its remains were visible as a faint fibrous concentric boundary, enclosing a mass of pus cells, and numerous micrococci. In many of the vessels the thrombi were necrotic. Purulent infiltration of the cellular tissue of the orbit was spreading from the veins.

Wherever cell disintegration and necrosis were proceeding, microbes were abundant; they belonged to the pyogenic staphylococcus group; they were most numerous in the purulent thrombi, from which they had probably spread to the orbital tissues and elsewhere.

The arteries and nerves in the orbit exhibited no changes of importance, although signs of inflammation were not wanting in both. Purulent dæcryo-adenitis was present.

General Considerations.—In the first of these two cases the left tonsil, which was the seat of a gangrenous inflammation, was the source from which infection spread to the cerebral sinuses, and thence to the orbital veins. A buccal source of infection in cerebral or orbital thrombotic phlebitis has been frequently observed; three previous cases are on record in which the primary lesion was in the tonsils. A peculiar feature in this case (and in some previously noted) was the earlier appearance of orbital symptoms on the right side, although the left tonsil was gangrenous. The writer enters fully into hypothetical explanations for this apparent irregularity, adduced by other observers as well as by him.

In the second of Mitvalsky's cases, search was made in vain for the primary source of infection. In this instance the earliest symptoms were referable to the orbital inflammation, those of intra-cranial disease developing after the exophthalmos had been noticed.

In this patient, although the disease in the left orbit existed for six days and a-half, no pathological signs were found in the right orbit at the *post-mortem* examination. This immunity of the right orbit, the writer thinks, may be explained by the presence of protective coagula at the junction of the infected cerebral sinuses, and the ophthalmic vein of the healthy side.

The clinical aspect of these cases is briefly dealt with by the writer, who also describes at some length the anatomical conditions to which the various ocular symptoms were referable. A short reference to some of these points must here suffice. The earliest signs in such cases appear to be chemosis of the lower portion of the bulbar conjunctiva, and œdema of the upper lid, followed by exophthalmos; the displacement of the globe is generally straight forwards. As a rule, its movements are unimpaired till a late stage of the disease has been reached, and then the cause is thought to be mechanical interference with the ocular muscles, by the infiltration of the cellular tissue.

The ophthalmoscopic picture was that of extreme vascular stasis in the retina and choroid, in the first case amounting to actual thrombosis, or thrombotic inflammation of the central vein of the retina. A marked difference in respect of vision existed; in the first patient both eyes became blind; in the second, sight in the affected eye was retained till the end. This the author explains by the greater obstruction to the blood current in the retina in the former case; he states that in primary orbital thrombosis —or thrombo-phlebitis as he calls the condition, and he considers his second case to have been of this nature—the blood stream is less easily arrested in the veins, than in instances like his first case, in which infection spreads from the cerebral sinuses to the veins of the orbit and the central retinal vein. Exophthalmos has not always been present

in orbital thrombosis, although a marked sign in the cases now recorded. It is caused by œdema of the orbital cellular tissue, in the author's opinion, and such œdema arises only when thrombosis and inflammation have reached the smaller venous ramifications ; blocking of the large venous trunks only, does not give rise to proptosis.

Bacteriological Investigation.—In the first case the pneumococcus of Fränkel-Weichselbaum was found in large numbers in the fresh specimens and in the hardened portions of orbital tissue. These microbes were found in the interior of the veins, mixed with products of inflammation; they had developed with greatest vigour in the contents of the smaller blocked veins. These micrococci are found in the buccal and pharyngeal cavities in health as well as in disease, and their extension to the cerebral sinuses and thence to the orbital veins, under suitable conditions, is not very surprising. It is conceivable, the writer thinks, that there was in this case a secondary infection of a diseased tonsil already the seat of streptococci, by the pneumo-coccus, and leading to necrosis of the tonsils and adjoining tissue.

In the second case, the active microbe was the *staphylococcus pyogenes aureus*, which Mitvalsky thinks may have come from the skin of the patient's face. This micro-organism was found in the blood, in the purulent material in the cerebral sinuses, and about the basal meninges, and in the large thrombosed veins of the orbit. Large numbers were also present in the degenerate portions of thrombi and of orbital tissue, and also in smaller veins in which coagulation was apparently recent, and whose walls showed no material alteration. A list of references to the literature of the subject, given by the author, forms a suitable termination to his very careful paper.

J. B. L.

TREACHER COLLINS (London). Researches into the Anatomy and Pathology of the Eye. London: H. K. Lewis, 1896.

This is a well printed and admirably illustrated volume of 130 pages, presenting in an extended form, and with some additions, the well-known lectures given by the author at the Royal College of Surgeons in 1894. It deals with various points in the anatomy and pathology of the eye, which he made the subject of original research while holding the post of curator of the museum at the Royal London Ophthalmic Hospital. As chief among these may be mentioned the development of the suspensory ligament of the lens, normal and abnormal, and its relation to congenital imperfections in the lens; various forms of congenital cataract and congenital abnormalities in the vitreous humour; the arrangement of the pigment-epithelium of the iris and ciliary body, and its secretory function; cysts of the iris; the nature of glioma; the less common varieties of glaucoma depending on congenital imperfections of development in the eye, and those following cataract extraction, together with the *modus operandi* of iridectomy in the relief of tension; and the various structural changes produced by concussion of the eye.

These subjects are treated, not in a systematic way, but from the point of view of the writer's own researches, and it is not too much to say that in each chapter are to be found points which the writers of systematic treatises must incorporate in their works.

The points on which Collins' views are open to objection appear to us to be few, but there is one statement which needs correction. On page 5 he gives a table of measurements showing the dimensions of the fœtal eyeball and lens from the fourth to the ninth month. These show, naturally, a continuous increase as the fœtus grows. For comparison with these he gives the dimensions of the adult eyeball and lens, quoting them from Merkel. If Mr. Collins had consulted the numerous bisected eyes which

he has himself prepared, or the scale-photographs of healthy eyes which have been published during the last few years, he would not have perpetuated the error of giving the antero-posterior diameter of the adult lens as 3·7mm. This mistake leads him, a few pages later, to the amazing statement that the transverse diameter of the adult lens is nearly three times as great as the antero-posterior diameter, and that this latter is somewhat greater in the fœtal lens than in that of the adult! A little more care also is wanted in the spelling of the names of some of the foreign authors whom he quotes.

The many important matters of which the author speaks cannot be discussed in detail here. The book is one of real scientific value, and reflects credit not only on its author, but on the hospital which afforded him the opportunity for carrying on original research.

VAN DUYSE (Gand). The Röntgen Rays in Ocular Surgery. *Arch. d'Ophtalmologie, February*, 1896.

The interest and importance of the possible application of the *x* rays in all branches of medical science justifies a notice of van Duyse's brief account of some experiments he has made. Probably every ophthalmologist, since Röntgen's discovery became known, has thought of the possible value of these rays in the detection of metallic chips in the eyeball, undiscoverable by means of the ophthalmoscope.

The writer has made some experiments upon the eyes of rabbits by introducing shot or irregular fragments of lead through a small incision at the sclero-corneal junction, either into the anterior chamber or the vitreous. He then exposed the anterior part of the eye for twelve

minutes to the Röntgen rays passed through it from above. and impinging upon a protected sensitive plate fixed below the eye. By these means he obtained an outline of the anterior segment of the globe in which the shot was distinctly shown as a dark round spot.

The shot in the eye of the rabbit was invisible by the ophthalmoscope, and was found on dissection close to the equator of the lens at the upper part.

A human eye, after enucleation, exposed to the *x* rays for ten minutes, showed on development of the plate, some lead pellets within the globe, and a well defined contour of the whole eyeball.

The author states that in man the presence of metallic chips in the anterior part of the eye can be determined by the application of Röntgen rays to the eye *in situ*, but we do not gather that this has been done. The difficulty is obviously that the human eye is not, as a rule, sufficiently prominent to enable the sensitive plate to be so placed as to intercept rays passing through the front part of the globe; van Duyse, indeed, suggests, in view of this difficulty, that a temporary exophthalmos might be produced by the injection of normal saline solution into the capsule of Tenon. This suggestion is not, we imagine, one which will be put in practice.

J. B. L

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

E. NETTLESHIP, F.R.C.S., President, in the Chair.
THURSDAY, MARCH 12, 1896.

Keratitis Occurring in Leprosy.—This paper was read for Mr. Kenneth Scott (Cairo) by the Secretary. One of the patients was a male Egyptian, who had been afflicted with anæsthetic leprosy for many years. Included among the affected parts were most of the muscles supplied by the facial division of the seventh nerve. He was unable to close the eyes, which were therefore exposed to external irritation. There was diffuse infiltration of the lower portions of both corneæ with a group of three or four raised papillæ covered by epithelium. Similar papillæ were found in a second case. The author would have regarded the corneal affection as due to exposure only had it not been for the presence of these small groups of raised papillæ.

Recurrent Paralysis of Ocular Nerves.—This paper, by Dr. Ormerod and Mr. Holmes Spicer, was read by the latter. Seven cases were narrated, three of which were instances of paralysis of the third nerve. The patients had suffered from a periodically recurring one-sided headache, attended with vomiting, and a sense of illness, the attacks varying much in intensity. The slighter attacks had passed off after a few hours ; the more serious ones had lasted several days, and had been accompanied by sudden and nearly complete paralysis of the corresponding third nerve. In the earlier attacks the paralysis was recovered from, but after several recurrences some of the divisions of the third nerve became permanently paralysed. In one of the cases there was partial atrophy of the corresponding optic nerve. The fourth case had recurrent paralysis of both third nerves, occurring after a long course of periodic headaches,

in which the ultimate condition was one of complete ophthalmoplegia externa of both eyes. The remaining cases were of paralysis of the sixth nerve, in one of which the seventh nerve was also involved, and in the other the third was partly involved. The opinion was expressed that the term "migraine" which was commonly applied to these cases was an unfortunate one; there was no history of the other migraine phenomena in the published cases, such as hemianopsia or scotomata or visual spectra; moreover, the motor character of the affection and the persistence of the impairment of movement pointed to a definite focal lesion at the base of the brain, an opinion which was supported by the results of *post-mortem* examination.

The President thought the authors were to be thanked for having put all these cases together so that the present position of our knowledge as to such cases might be rightly estimated. The subject was still unexhausted.

Mr. Grimsdale had shown a boy just recovering from the sixth attack, which resembled many of the cases mentioned by the authors. The attacks in this patient always came on in cold weather, and were associated with tenderness on pressure of the globe.

Dr. Ormerod had reported to the Society several years ago some cases of localised unilateral paroxysmal headache, followed by œdema or ecchymosis of the lid. He mentioned them because some of the cases mentioned by the authors were said to have local congestion of the eye during the attacks.

Dr. James Taylor thought there was room for further investigation of these cases. There was evidence of affection of the trunk of the nerve rather than of the nucleus. In the cases which had come under his notice the paralysis had gradually become permanent. He did not think trigeminal neuralgia was at all commonly associated with third nerve paralysis. There was no anæsthesia in most of these cases, such as would exist if the fifth nerve were involved.

Dr. Colman referred to a case of this kind that he had recently observed, in which there was rapid flapping of the

eyelid up and down at the beginning of the attack; this he regarded as the representation of a motor convulsion. He did not agree with Dr. Taylor that the symptoms pointed to an affection of the trunk of the third nerve, as in some of the recorded cases there had been no paralysis of the iris. Other cranial nerves were always implicated. He thought an extensive tract of grey matter, including the nuclei of these nerves, was the seat of the lesion. He would not group these cases under the heading migraine, as in none of them were any of the visual phenomena associated with that condition present.

Mr. Priestley Smith had been accustomed to regard these cases as due to a general diathetic condition, like ordinary neuralgia or sciatica, rather than to a focal lesion. He had had one case which was a therapeutic success; it was that of a young man who had had skilled treatment for some time without benefit. He had put him on an elimination course of free hot water drinking; his headache had been much diminished, and he had had no recurrence of paralysis.

Mr. Ernest Clarke had had one case of this kind in which complete recovery had followed correction of an error of refraction in the affected eye.

Dr. Hill Griffith had seen painful subcutaneous nodules mentioned in cases of fifth nerve neuralgia. He asked if others had observed them, as he had looked for them unsuccessfully.

Mr Power thought that worms might be a possible cause of this recurring paralysis.

Reflex Amblyopia due to Pregnancy.—This case was reported by Mr. Lawford Knaggs. The patient at the age of 32 lost the sight of her left eye during a pregnancy. When first seen that eye diverged, had no perception of light, and showed atrophy of the optic nerve. There had been four children since. She was seen again at the age of 40 when she was four months pregnant; the fundus of the right then appeared normal, but there was rapid failure of sight from $\frac{6}{12}$ to less than ability to count fingers, loss of

colour vision, and concentric contraction of the visual fields. Premature labour was induced, and six months later vision had again become $\frac{6}{6}$, and the field was restored to the normal except for the obliteration of the right inferior quadrant; colour vision was perfect; the appearance of the optic disc suggested partial atrophy. A year later the patient once more became pregnant; there was again loss of sight, with contraction of the field, the colour vision being unaffected. Abortion was again procured. Vision was restored to $\frac{6}{6}$, the field regained its former size, except that the right upper quadrant was lost. The prognosis of this form of amblyopia was very serious; it was probably produced by a deficient blood supply resulting from vasomotor constriction of the vessels of the chorio-capillaris. If there was loss of visual acuity with progressive contraction of the visual fields the pregnancy should be terminated in order to avoid the risk of permanent blindness.

Dr. James Taylor thought that the title of the paper ought not to pass without discussion. The condition of the visual fields was not like that typical of a functional disorder, and he thought it was going too far to label the case reflex amblyopia when there was evidence of grave organic change.

Mr. Priestley Smith thought it possible that local conditions of the generative organs might set up a temporary spasm of the retinal vessels which, if prolonged, would result in all the signs of blocking of the retinal artery. In Mr. Knagg's case the condition was probably due to a vascular lesion, as the scotoma started from the optic disc.

Mr. Johnson Taylor thought the case was probably one of atrophy of the optic nerves coming on at different times in the two eyes. Aggravation of the symptoms during pregnancy might, not improbably, be due to the general systemic disturbance which that condition caused.

The President thought it possible that the affection was chiasmal, first affecting one optic nerve at its emergence from the chiasma, then, later on, travelling back and

involving part of the remaining fibres. The variations in the size of the field might be taken to be reflex.

Card Specimens.—Mr. Laws: Case of Retinitis Circinata. Mr. Doyne: (1) Case of (?) Aneurysms of Retinal Vessels; (2) Ossification of Choroid and Calcification of Lens. Mr. Rockliffe: Sarcoma of Orbit. Mr. Ridley: Glaucoma following Cyclitis. Mr. Poulett Wells: Transverse Films of both Corneæ. Mr. Grimsdale: Recurrent Paralysis of Third Nerve. Mr. Ernest Clarke: (1) Detachment of Retina; (2) Sarcoma of Choroid. Mr. Sydney Stephenson: Unusual Arrangement of Retinal Arteries.

DERMOID TUMOUR OF THE ORBIT.

By Robert W. Doyne, F.R.C.S.

Surgeon to the Oxford Eye Hospital.

The occurrence of dermoid cysts within the orbit is rare, and the manner of their localisation has been differently explained. There is a good article on the subject in the *Traité complet d'Ophtalmologie* (de Wecker and Landolt). Dr. Milvalsky discusses their pathology in the *Archives of Ophthalmology*, 1892 (Knapp and Schweigger), and gives a bibliography of the subject. In the same Archives, 1895, Milikin reports a case and gives several references to other reported cases, and in the *Archives d'Ophtalmologie*, 1893 (de Wecker), de Lapersonne narrates a case to which perhaps mine may bear some resemblance.

W. B. was admitted into the Oxford Eye Hospital on February 27, 1896. He stated that nothing whatever had been noticed, and both eyes were quite alike until three weeks ago, when the right began to be prominent, and this condition had rapidly increased. He had no pain, and did not complain of diplopia. No history could be obtained that threw any light on the condition. There was very marked proptosis of the right eye, but it seemed to move normally in all directions, and no diplopia could be made manifest. It should be mentioned, however, that after the operation, when there was evident limitation of move-

ment outwards, he did not acknowledge diplopia. There was no fulness in the temporal region of that side, and the finger could be pressed into the orbit quite easily above and below the eye-ball as far as the skin would allow ; but on the outer side the hard edge, as if indurated, of the lacrymal gland, could be felt projecting beyond the edge of the orbit.

He was kept under observation for a few days, but no difference in the condition was noted. On February 29 I made an incision along the outer side of the brow, which I afterwards prolonged to nearly its whole extent, and proceeded to dissect out the lacrymal gland, which in my mind I had associated with the trouble. I found the tumour, as I had suspected, reaching to the back of the orbit, and almost despaired of removing it without sacrificing the eye, when the handle of the scapel, with which I was conducting the dissection, ruptured the wall of what proved to be a cyst. On introducing my finger, which readily advanced literally as far as I could reach, a quantity of atheromatous material was discharged from the wound. Mixed as it was with blood, my first thought, well supported by the extent my finger had gone into the orbit, was that I had tapped an encephalocele and was stirring up his brain. Examination showed the material to be that usually found in dermoid cysts, and to be very markedly laminated ; judging not only from the feel but by the contents of the cyst, it must have been the size of a large walnut. The contents were scooped out and an attempt made to explore the region with the finger ; the outer wall of the orbit was found to be absent, and a sharp edge of bone was felt along the lower part, while directly backwards and upwards behind the globe I could reach no bony limit. I confess that I did not make an enthusiastic exploration in this direction, for I could not realise where my finger might

be ; and on subsequent comparison with a skull I find that the depth of the orbit only admits the last two phalanges of my index finger. A drainage tube was inserted, and the extreme limits of the wound stitched up. The eye had sunk back into its normal position, and healing went on rapidly without any complication, while occasional discharge of some atheromatous material persisted from the tube, which on microscopical examination showed epithelial *débris* and cholesterine crystals in abundance.

A fortnight later, as there was a little prominence of the eye, I opened the wound again under chloroform, feeling that I had not got away the wall of the cyst, and being anxious also to make a more thorough examination of the orbit, but it was with difficulty that I could sufficiently displace the eye and get my finger along the sinus, and all that could be felt was the absence of the external wall, intermittent pressure of a finger of the other hand on the externally temporal region being plainly communicated to the finger in the orbit ; but the limits of the deficiency could not be made out, nor could any examination be made of the regions that were unexplored at the first operation. The manner in which the seat of the cyst had contracted reminded me forcibly of the rapid way a frontal sinus dilated by an empyema will contract after tapping. Upon one occasion after opening such an empyema and exploring the dilated sinus with my finger with the greatest care in all directions, I was unable to complete the operation by restoring the communication with the nose owing to my not having a necessary instrument at hand. Quite shortly afterwards it was with the greatest difficulty that I could get my finger in to do what was necessary. The bony walls in this neighbourhood are so thin that they seem to be able to readily adapt themselves to altered conditions ; though, in the case of the cyst, I am unable

to say whether it was by contraction of bony or soft parts that the gap was filled up. Dr. Gordon and Dr. Phear on this occasion also explored the sinus, coming to the same conclusion as myself with regard to the outer wall, but they could form no opinion as to anything further.

Subsequently, on dressing the case, which still remains under observation, pressure externally on the temporal region was noticed to produce discharge from the orbital drainage tube.

C. HESS (Leipzig). **Lenticular Opacities in their Relation to General Diseases.** *Sammlung Zwangloser Abhandlungen aus dem Gebiete der Augenheilkunde. I. Band, Heft* 2. Halle a. S.: Karl Marhold, 1896.

Starting with the axiom that every form of cataract has its ultimate cause in a disturbance of the nutritional relations of the lens, Hess considers his subject under two heads, according to the mode in which such disturbance may arise: I.—the various forms of cataract in which there is a *direct* dependence on general constitutional disease, under which he includes (1) senile cataract; (2) diabetic cataract; (3) naphthalin cataract; (4) ergotin cataract, with some more rarely occurring forms dependent on other constitutional conditions; (5) congenital cataracts; II.—those cataracts which have their immediate origin in *local* (ocular) conditions, but which are yet constitutional in the wider sense that the ocular lesion is merely the local expression of a general disease. Under this head come (1) posterior polar ("choroidal") cataract; (2) "cataracta complicata."

Before proceeding to the subject proper, he briefly reviews the recent advances in knowledge as to the *nutrition of the normal lens*, particularly those derived from experimental researches on naphthalin cataract.

Most observers are agreed that a fluid interchange of considerable activity takes place between the lens and its surroundings. Pigments in solution introduced into the blood-stream rapidly find their way to the region of the equator of the lens, and presently into its substance. In artificially-produced glycosuria sugar is demonstrable in a very short space of time in the tissues of the lens. Evidence has also been adduced pointing to the existence of nutritive currents in the lens itself. Thus Schlösser, from his observations on experimentally produced traumatic cataract, believes that "the nutritive stream enters the lens at the equator, passes to the centre of the posterior cortex, thence by way of the posterior rays flows round the nucleus (in the perinuclear canals), is collected by the anterior rays, and finally flows out by a circle of puncta, which are to be regarded as the openings of exit." These puncta, or pores, lie in the anterior capsule in about the region of the edge of the dilated pupil. Magnus doubts the existence of Schlösser's canals; he thinks that "a zone lying behind the equator, and parallel with it, receives the great bulk of the nutritive current; that in the posterior half of the lens the nutritive exchanges are of greater activity and volume than in the anterior; that but little current reaches the posterior pole, and practically none the anterior." The question of the place of exit he leaves open. Samelsohn, from the changes in position of rust-particles in a lens which had been penetrated by a steel chip, concluded, with Schlösser, that an equatorial stream traverses the lens in a centripetal direction, collecting towards the anterior pole, and hence streaming outwards again to the insertion of the zonula, where it leaves the lens and enters the posterior chamber. Samelsohn's observations have been confirmed by several other investigators. Hess has himself noticed the gathering together of rust particles under the anterior capsule, but no one

has yet been able to demonstrate the supposed pores of exit in the anterior capsule, and Hess does not think that the existence of a nutritive current in the lens is yet conclusively proved. For the questions now under consideration, however, it is of little moment whether the noxious substances which affect the nutrition of the lens fibres are brought to them by a stream or reach them by simple diffusion.

The physiological changes in the lens at different age-periods are of great importance for the right understanding of its pathological conditions. The substance of the young lens is clear and soft, almost mucous in consistence, its elasticity being due solely to its capsule. In the twentieth year a firmer nucleus begins to be differentiated from the rest of the lens, and gradually increases in hardness. It increases also in bulk, at the expense of the cortex, so that the layer of soft lens capable of altering its shape in response to variations in tension of the zonula, becomes progressively less and at last disappears. The increase in hardness of the lens fibres is accompanied by a corresponding increase in their resistance; thus, while a small wound in the lens capsule of a child leads in a few days to complete opacity, and perhaps in a few weeks to complete absorption of the lens substance, a similar lesion in an adult will produce only a very slowly extending opacity of the cortex, which may finally be limited to the region of the wound.

I.—(1) *Senile Cataract.*

The dependence of senile cataract on any definite disease of advanced life has never been proved; many observers regard its origin as referable to local causes only. Our first definite ideas on the early stages of senile cataract were derived from the researches of Förster and Becker. Förster showed that the development of the cataract was preceded by a marked differentiation of the nucleus from the still clear transparent cortex; according to him the first opacity shows itself in the majority of cases as a zone

of fine grey streaks about the equator of the nucleus. Hirschberg and Magnus regard the vacuole as the primary form of lenticular opacity, and according to Magnus there are three principal seats of its first occurrence—(1) just in front of and behind the equator of the lens; (2) at the poles; (3) at the equator of the nucleus. Becker believes the origin of both streaks and vacuoles to lie in the shrinking of the nucleus, which causes a dragging on the cortical layers and the production of fissures and holes between the fibres. He cites in support of his views the observation of Priestley Smith, that senile lenses with beginning opacities are of smaller volume than clear lenses at similar ages. This short stage of diminished volume is followed by one of marked increase with advancing opacity (stage of intumescence) during which destruction of fibres is associated with increased absorption and fluid interchange between the lens and its surroundings; the aqueous may be found to be distinctly richer in albumen at this stage than under normal conditions. Following this again comes the stage of inspiration with diminution of volume, the period during which the cataract is "ripe." Further changes may take one of two directions, the cortex either continues to dry and harden, or it degenerates into a milky fluid in which the nucleus sinks to the bottom of the capsule.

Becker believes senile cataract to be essentially due to a constitutional cause. "Since not every individual who reaches a certain age suffers from cataract, there must be some exciting cause for it. Since, further, simple senile cataract always affects both eyes, this additional cause must be one affecting the whole individual." As to the nature of the cause Becker expresses no definite opinion. Deutschmann, from examination of the urine, came to the conclusion that a certain number, at least, might be separated from the great group of senile cataracts as nephritic in origin. Michel regards atheroma of the carotid as standing in intimate relationship with opacity of the lens. Both chronic nephritis and atheroma are, however, well known to be of relatively frequent occurrence

in individuals of the age at which senile cataract develops, and the statistics of other observers tend to show that they are not more frequent in the cataractous than in the non-cataractous.

From the point of view of a local origin Magnus believes the pathological basis to be a damming back of the lymph stream in the lens at its exit in the neighbourhood of the equator, the lens fibres being pushed asunder by the pent-up fluid and a system of fissures produced. For the less numerous cases (7·6 per cent.), where the opacity begins at the edge of the nucleus, Magnus suggests "an unequal division of the nutritive stream" as an explanation. Schön regards the tension exerted on the capsule by the zonula during accommodation as leading ultimately to the development of opacity; and Hess, while regarding his view of the mechanism of accommodation as demonstrably erroneous, by no means rejects the idea of a connection between accommodation and lenticular opacity; the accommodative variations in shape of the lens in advanced life can only be effected by the movement of a relatively thin layer of soft cortex on the unyielding mass of the nucleus, and this may well give rise to fissures between the fibres. He mentions an observation on an old iridectomised patient of his own, in whom the periphery of the lens could be readily seen; after the action of eserine (and conseqeent relaxation of the zonula), the anterior surface of the lens margin was seen to be perfectly smooth and even; if atropine were used there appeared in this position a line of wavy prominences and irregular bulgings, due to traction by the fibres of the now tense zonula.

As a matter of curiosity, Hess mentions that senile cataract has recently been ascribed to the action of micro-organisms!

He sums up the results of the researches of the last twenty years, as showing that senile cataract can be regarded neither as a purely local nor as a purely constitutional affection. Both factors are concerned in the process, and the more exact differentiation of the action of each presents a field for fruitful research.

(2) *Diabetic Cataract.*

In 1830 several observations were published on the occurrence of a form of cataract in connection with diabetes, and the relationship has since been well established; it might serve, indeed, as the type of a cataract dependent on constitutional conditions. As to the frequency of its occurrence, v. Gräfe thought that 25 per cent. of diabetics suffered from it, but later observers have given much smaller figures—4, 3, and 2 per cent. Out of 1,100 cases of cataract extraction, Becker found that eleven had sugar in the urine.

There is nothing characteristic about the lenticular opacity in this affection, in the sense, at least, that one could diagnose the presence of diabetes from the appearance of the cataract. Its development is the more rapid the younger the patient, even extraordinarily so, Litten mentioning the case of a young diabetic in whom it developed in the course of a few hours. Of the proximate cause of the opacity nothing certain is known; the human lens, placed in 5 per cent. sugar solution, will become opaque from loss of water, and a similar result can be obtained in the eyes of rabbits and frogs by filling the conjunctival sac with sugar or salt; but these conditions hardly represent those occurring in the diabetic patient. (Deutschmann, in a diabetic girl aged 10, found in the aqueous only 5 per cent. of sugar; in the vitreous ·366 per cent.) Moreover, the opacities thus produced completely disappear on removal of the sugar or salt, while those of the diabetic lens, consisting as they do of degeneration of fibres and cells, cannot disappear, even if the diabetes is cured. It does not appear that the mere presence of sugar in the lens necessarily gives rise to opacity, nor is sugar always demonstrable in the diabetic cataract itself.

(3) *Naphthalin Cataract.*

The study of experimentally produced naphthalin cataract has led to somewhat more definite results. If repeated small doses (1—2 grammes) of naphthalin be

given to rabbits, they become emaciated from severe intestinal catarrh, and cataract appears, often together with extensive degeneration of the retina. In the equatorial region of the lens are first seen fine clear spokes, which soon become cloudy, and neighbouring spokes running together, in a few days the whole subcapsular cortex is evenly opaque. Microscopically, there are found in the first stage extensive degeneration of the epithelium of the anterior capsule and numerous vacuoles in the lens fibres, especially in the parts close to the equator. In a later stage the lens fibres break down into irregular granular masses, and there are developed clumps of rapidly multiplying epithelial cells on the inner surface of the posterior capsule at the equator, the nucleus remaining clear. Clinically, the process closely resembles the development of diabetic cataract, and microscopically there is hardly anything to distinguish a naphthalin cataract from either the diabetic or the senile form.

That the changes cannot be regarded as secondary to the retinal affection is shown by the fact that they sometimes occur without the presence of the latter. Similarly diabetic cataract is not to be considered as dependent on the retinal changes (degeneration, hæmorrhages, &c.) which not unfrequently accompany it. A further point of resemblance lies in the fact that the actual presence of naphthalin in the lens appears to be as little essential as the presence of sugar in the lens in the case of diabetic cataract.

In both we recognise the necessity for some middle term connecting the general disease with the affection of the lens, and may use the expression "disturbance of nutrition" to supply the link. That some nutritive changes are at work in the immediate vicinity of the lens is rendered probable by the very peculiar alterations in the pigment epithelium on the back of the iris, first described by Kamocki. It consists in an œdematous swelling, often to an enormous degree, and proliferation of the epithelial cells, and appears to be present in the large majority of diabetic eyes. Magnus and Kolinski found in the early stages of naphthalin cataract a high degree of hyperæmia of the

ciliary body. A case of Nettleship's, a diabetic with one of his lenses dislocated, in whom opacity developed much later and more slowly in the dislocated lens than in the other, suggests that the disturbing agent acts with greatest intensity in the part of the ciliary body which is normally applied to the equator of the lens.

After describing briefly the treatment of senile and diabetic cataract Hess proceeds to the

(4) *Rarer Forms of Cataract in connection with General Diseases.*

A form of cataract has been observed associated with the epidemics of *ergotin poisoning* which have visited certain Russian provinces during the last twenty years. According to Tepliaschin, it appears from two to five years after the poisoning, but some of Kortnew's cases began within two months of the beginning of the epidemic. The majority of the patients were between 30 and 40 years of age, but children were attacked as well as adults. It is described as a smoky grey opacity extending from the centre to the periphery of the lens, becoming complete in from one to eleven months. It occurred only in connection with the convulsive form of the disease, and is ascribed to spasm of the vessels of the ciliary body.

Michel and Abadie have each described a case of double soft cataract developing in connection with *idiopathic tetanus.* Hess quotes Bagot as describing three cases of cataract in connection with *malarial fever*, but reference to his paper shows that only two of these are cases in point, the third being one of optic atrophy and not of cataract. Of the former both were cases of "bilious fever" of severe type, and the circulatory disturbances were so profound that the development of cataract might well be referred to these, rather than to any specific action of the malarial poison. *Meningitis* and *syphilis* have each been held responsible for the causation of cataract.

Fontan describes as a special form "*post-typhoid* punctate cataract." Several writers have noted the occurrence of

posterior polar cataract during *lactation*, but as retinal and vitreous changes were also present the cases are perhaps rather to be placed under the head of secondary cataract. Power has described several cases in which, after repeated child-bearing, each successive *pregnancy* has been followed by deterioration of vision from an advance of opacity in the lens.

(5) *Congenital Cataracts.*

Hess gives a brief description of the clinical varieties of congenital cataract—lamellar, nuclear, spindle and total—pointing out that their differences are mainly differences of degree, that all show a tendency to be transmitted by direct inheritance, and that one form appearing in the parent may be followed by another form in the child. He has seen a case in which it was transmitted through four generations, and one cataractous mother gave birth to fourteen children, of whom twelve were cataractous.

Lamellar cataract was not for a considerable time regarded as congenital, but following the observation of Arlt, that a large proportion of the children in whom it was found had suffered from convulsions in early infancy, it was supposed to have its origin in the disturbance of the lens so produced, and classified as a variety of contusion-cataract. The now generally accepted view is that the cataract, as well as the convulsions, the ill-developed teeth, skull and brain, with which it is so often associated, are all indications of the action of a pre-natal diathesis, which by many observers is considered to be rickets.

The anatomical appearances of the typical lamellar cataract consist in a zone, surrounding the nucleus, of very numerous fine round dots having a higher index of refraction than the lens substance. Outside this zone, the cortical layers are in most cases quite normal; but the nucleus within always contains similar dots, though in much smaller number. Beselin regards lamellar cataract as the result of a chemical alteration in the lens, due to a disturbance in its nutrition of rachitic origin, which acted at a time when the present nucleus constituted the whole

lens; the perinuclear opacity he looks on as due to fissures developed by subsequent shrinking of the nucleus. Schirmer considers the lamellar opacity to be due to the action on *developing* fibres of a noxious agent which at the same time, by its effect on the already developed fibres, produces the changes found in the nucleus. Only the so-called "riders" at the margin of the opacity, which are anatomically represented by fissures between the fibres, he regards as subsequently developed by the process of shrinking. And with this view Hess agrees. He describes, as bearing on the development of lamellar cataract, an interesting observation of his own on a malformation of the lens in an embryo-chick of five days. The lens capsule, which should at this period have been completely closed, presented a slender canal passing from its anterior pole to open on the general ectodermal surface; through this the long lens fibres springing from the posterior capsule had pushed their way, and showed marked degeneration and opacity, not merely of the extruded portion, but also of the deeper part still within the capsule. Supposing that at this stage the closure of the capsule had been completed, we should have had the necessary conditions present for the production of a congenital nuclear cataract. The plausibility of this theory becomes much greater if, as Hess asserts, there can generally be discovered, both in the nuclear and the lamellar forms of congenital cataract, a minute opacity at the anterior pole.

A short discussion of the treatment of lamellar cataract follows, and the author then proceeds to the second section of his subject, viz., cataracts having their immediate origin in ocular disease.

II.—(1) *Choroidal Cataract.*

Ophthalmic surgeons have long been aware that opacities at the posterior pole of the lens are apt to develop in various affections of the internal tunics, especially of the choroid, so that the distinctive name of choroidal cataract has been applied to them. Of the affections of the general health

which have been found associated with choroidal cataract a long list might be given; speaking generally, however, there occur with especial frequency conditions of exhaustion, such as anæmia, marasmus, &c.; so that Ulrich has suggested the name of "starvation-cataract" for the condition.

The anatomical changes consist in a marked proliferation of the capsular epithelium along the inner surface of the posterior capsule up to the posterior pole, and the development of slit-like fissures between the fibres and degeneration of the latter.

It may well be understood that the prospects of operation on choroidal cataract, should it become complete, are by no means favourable.

A special form of choroidal cataract is that met with in retinitis pigmentosa, an affection in which disease of the choroid is probably the most essential factor; it differs from that already described in its markedly stationary character, the changes remaining limited to the posterior pole.

(2) *Cataracta Complicata.*

Of a somewhat different character are the cataracts which depend on a cutting off of the nutrition of the lens by exudations in its vicinity, to which the name of cataracta complicata has been given. Severe irido-cyclitis is the most frequent causative lesion, and this again may have its origin in a variety of constitutional diseases, such as syphilis, rheumatism, and gout.

The author appends a list of 98 references, which, though making no pretension to completeness, he thinks may be of use to non-ophthalmological colleagues who wish to pursue the subject.

W. G. Laws.

P. SILEX (Berlin). On Partial Isolated Paresis of the Orbicularis Muscle of the Lid. *Archives of Ophthalmology*, *xxxii.*, 2 (*German edition*).

Although paralysis of the orbicular muscle of the lid is well known as part of a paralysis of the facial nerve, no case is on record where it has been observed alone. Silex relates three cases, all women, in whom a paresis of the orbicular muscle of the upper lid of one eye only existed. In all three the symptoms had set in suddenly, and consisted of an incomplete lowering of one upper eyelid, both when the eye was kept open and when it was intended to be kept closed. When open the sclera was visible above the cornea to a width of 1½ to 2 mm., whether the eye was directed upwards, forwards, or downwards, and the closing was not quite perfect. The lower lid, as in fact every other muscle, was acting normally. Treatment with iodide of potassium had no result. In one case recovery took place after a year and a half, and was permanent; the other two are still *in statu quo* and under observation.

As far as the diagnosis is concerned, the following diseases had to be excluded:—

(1) Graves's disease. There were none of the many characteristic symptoms present, nor did they ever appear. One-sided affections in this malady have, moreover, only been recorded in nine cases in the whole vast literature of the subject. Even in those cases of Graves's diseases where ocular symptoms alone have been observed, exophthalmos was never absent. The belt of white sclera visible between the cornea and the margin of the upper lid gradually decreases as the eye is turned downwards in Graves's disease, while in the author's three cases it remained constant.

(2) The anomaly of the position of the upper lid in Graves's disease is attributed to a spasm of Müller's muscle, situated in the upper lid and consisting of organic muscle fibres under the control of the sympathetic nerve. A paralysis of this muscle is always accompanied by other symptoms, such as myosis and decrease of tension. In

the case of an excitation it might therefore be expected to find similarly associated symptoms. Subcutaneous injections of morphia relieve temporarily Graefe's symptom in Graves's disease; but in the author's cases it failed to have any effect at all, while instillation of cocaine produced an increased elevation of the upper lid.

(3) A tonic spasm of the levator could be excluded by the long duration of the state, by the fact that no resistance was felt when the upper lid was pulled down gently by the lashes, and by the absence of any traceable cause for such a spasm, as for instance an affection of the frontal or ethmoidal sinus, periostitis, neoplasm, &c.

Nor were there any other causes for the anomalous position of the upper lid, such as may be due to increased innervation of the one eye when the other is affected, *e.g.*, in chronic affections of the conjunctiva of one eye. In such cases, especially in trachoma, where the upper lid becomes heavy or thickened, a degree of innervation is required for the raising of the affected lid so great as to cause the upper lid of the healthy eye to be lifted above the cornea altogether. In a similar manner an eye convalescent from a paralysis of the third nerve in which the levator was included, will for the same reason produce an exaggerated gaping of the other eye, the so-called secondary deviation.

The rare condition of isolated paralysis of the superior recti muscles also produces this symptom, so that pathological experience would help to confirm the anatomical observation that the nuclei for the superior rectus and the levator are situated close together.

By exclusion the diagnosis for the author's three cases is therefore brought down to that of paresis of the orbicular muscle of the upper lid, due to a partial affection of the upper branch of the facial nerve.

Experimentally by Mendel, and clinically by Tooth and Turner, the existence of different nuclear districts for the upper and lower portions of the facial nerve has been made probable, suggesting for the centre of the upper branch a position near the posterior part of the centre for the third

nerve. In a series of cases of peripheral paralysis of the facial nerve, Mann found the orbicularis muscle of the mouth intact and the orbicularis of the eye, although affected, less so than the other muscles. In cases of complete and severe paralysis the palpebral orbicularis muscle recovered long before the frontal muscle showed any trace of improvement. From these observations and from the isolated paresis in his three cases, Silex deducts an origin from the nucleus of the third nerve only for the nerve supplying the orbicularis, but not for the nerve to the frontalis. This would be in harmony with the normal absence of connection in the action of the frontal and third nerve districts.

With regard to the question whether the three cases are to be considered as peripheral or central affections, the author prefers the former view. For although it is usual to assume a central seat for the lesion in cases where, of many branches of a nerve, a single one is either affected or not affected, it seems difficult to him to entertain such a view in his cases because they were unaccompanied by any other symptoms whatever, a condition which makes the existence of a central cerebral lesion highly improbable.

K. G.

E. FUCHS (Vienna). Retinitis Punctata Albescens and Atrophia Gyrata Chorioideæ et Retinæ: two Diseases akin to Retinitis Pigmentosa. *Archives of Ophthalmology*, xxxii., 2 (*German edition*).

The disease known as retinitis pigmentosa is a chronic, slowly progressive atrophy, with its seat more in the choroid than in the retina. The pigmentation is more of ophthalmological than of pathological importance, and the characteristic features of the chronic atrophy of

the retina are :—(1) its heredity; (2) its commencement in early life ; (3) its slow but irresistible progress ; (4) the appearance of hemeralopia as the first symptom ; (5) atrophy of the retina indicated by shrinking of the retinal vessels and atrophy of the disc.

The ophthalmoscopic appearances vary between those of the typical pigmentation, and an ordinary retino-choroiditis.

To this group further belongs the so-called retinitis punctata albescens, an atrophic retinitis characterised by the appearance of small white spots in the retina. The disease is one of childhood, and occurs usually in several members of the same family, often in children of blood relations. The visual field is greatly contracted, the central vision reduced, and night blindness exists from childhood.

A fresh case of this disease is described by Fuchs, the patient being a boy of 12, the child of a nephew and aunt. He is the only individual in the family affected with any eye disease, and from his sixth year has been unable to go about unaided at night. The eyes are externally quite normal, and so are the media and the fundus except for the presence of countless numbers of small white spots in the retina, arranged most thickly round the disc and the yellow spot, the latter, however, as well as the periphery of the fundus, remaining free.

Another form of chronic atrophic retinitis has been observed by Fuchs, and named by him atrophia gyrata chorioideæ et retinæ. Three cases of this affection have previously been observed by him and published by Cutler ; Fuchs now adds a fourth, and from these, and from a case of Jacobson published in 1888, he gives the following description of the disease. Generally more than one member of the same family are affected ; sometimes the patients are the children of blood relations. The first symptom is night blindness in childhood. Choroid, retina and disc are atrophic, the retinal vessels greatly contracted. The salient pathological feature is the peculiar form of the choroidal atrophy, beginning in various localities

as round white spots which increase in size until they coalesce, but often separated by small bridges of normally pigmented fundus. Both the pigment epithelium and the stroma of the choroid have atrophied, as is shown by the presence of some choroidal vessels which traverse the white ground of the atrophied patches. The atrophic patches form a wide belt, encircling the disc and reaching from the equator to very near the disc. The margin which looks towards the disc is sinuous and sharply defined from the normal tissue, and advances gradually towards the disc, until finally only a narrow ring round the disc remains. The yellow spot also may remain intact. Of constant occurrence in all cases hitherto observed is the stellate opacity of the posterior cortical layers of the lens, which is found likewise in retinitis pigmentosa. From the latter disease, however, the atrophia gyrata is distinguished by the choroidal atrophy, which gives a striking appearance to the ophthalmoscopic image. It is probable that the round atrophic patches, with their tendency to increase and ultimately join, are the expression of a morbid change which has its seat originally in the centre of the various vascular districts and progresses towards their periphery.

K. G.

G. E. De SCHWEINITZ (Philadelphia). The Toxic Amblyopias: their Classification, History, Symptoms, Pathology and Treatment. Philadelphia: Lea Brothers & Co., 1896.

Cases of toxic amblyopia, except from tobacco and alcohol, are rare; but the ophthalmic surgeon may fairly be expected to know something of any variety of it that may occur in his practice. He must gain a knowledge of the subject from its literature, and will therefore appreciate highly the clear, systematic and complete *résumé* of

it given in this book. The book is a well-printed octavo of 230 pages, with forty-six cuts illustrating the field of vision, and nine plates representing chiefly the results of studies with the microscope. There is nothing like padding; case histories are given sparingly and much condensed, and to the account of each form of amblyopia is appended an ample and apparently accurate bibliography of it. Apart from the interest and importance of its subject, it is a good piece of literary work.

The scope of the work is declared to be the consideration of "all amblyopias which are caused by the influence of toxic substances," and amaurosis is regarded as synonymous with amblyopia. As to classification, de Schweinitz says:—"Fully aware of the impossibility of presenting any classification that is free from objections, I have nevertheless, for convenience' sake, adopted an arrangement based upon prominent physiological and toxic actions." The difficulties of the case are well illustrated and emphasised in the classification that follows:—Class I. "Drugs chemically diverse, and, when given in physiological dose, producing greatly different effects, but when acting as chronic and sometimes as acute poisons, capable of originating definite tissue changes and degenerations, including alterations of the blood," is made to include — alcohols, tobacco, carbon bi-sulphide, iodoform, iodine, potassium chlorate, nitro- and di-nitro-benzol, benzine, cyanides, nitrites of amyl and ethyl, coal tar products, arsenic, lead, mercury, silver nitrate, phosphorus, oxalic, osmic, chromic and sulphuric acids, and ergot. The other classes are: II. Cerebro-spinal depressants. III. Caffein, thein and chocolate. IV. Acetanilid, phenozone, quinine and salicylic acid. V. Aconite, alcohol, and digitalis. VI. Mydriatics. VII. Myotics. VIII. Drugs used for the expulsion of intestinal parasites. IX. Drugs and poisons "possessing no definite actions worthy of special grouping." X. Ptomaines, meat, fungus and snake poisons.

The more one reflects upon this classification the more unsatisfactory it must appear. With a good table of

contents and a full index, such as are furnished in this case, imperfect classification may not detract seriously from the value of the book as a work of reference; but the basis of "prominent physiological and toxic actions" unrelated to the amblyopia, does not furnish the arrangement of facts most helpful to the working ophthalmologist. It would seem that with the facts collected, as in this work, a better classification had become possible, at least for the more common and important of the amblyopias which have been subjected to careful anatomical or clinical study, and which give the subject its chief interest. Of course scientific classification is quite impossible for the large number of superficial, indefinite, and unverified "observations" regarding the influence of many substances in causing impaired vision in exceptional cases, that are to be found in the literature of the subject. All that can be done with such material is to inform the student of its existence, and furnish a means of getting at it. This de Schweinitz has done completely, and with the least waste of space; and so far as was possible he has been orderly and systematic. Indeed it would appear that the attempt to systematise even the incoherent material just referred to has led to the adoption of the unsatisfactory basis of classification given.

Although the bringing together of the scattered records of similar and related observations has been the author's chief task, the work has been enriched by notes from his own carefully studied cases, and by the results of his experiments upon the lower animals. His chief experimental observations as to quinine blindness were published in this journal February, 1891. Experiments with cinchonine showed that in somewhat larger doses it produces effects similar to those of quinine; and similar experiments with salicylic acid and salicylate of sodium produced partial blindness with similar ophthalmoscopic appearances. The results of experiments with alcohol and tobacco were negative. In experiments on dogs with the oleo-resin of *Filix Mas* there resulted no positive signs of blindness, no demonstrable ophthalmoscopic or histologic

changes; and rabbits experimented upon died "without evidence of any other action of the drug than that of a depressant poison."

JENNINGS (St. Louis). **Colour-Vision and Colour-Blindness. A Practical Manual for Railroad Surgeons.** Philadelphia: the F. A. Davis Company, 1896.

This is a well printed and well arranged volume of 111 pages, designed for the use of those engaged in testing the colour-vision of railway officials and others whose occupation requires that they shall be free from colour-blindness in any form. The book will undoubtedly be of service to such examiners; the latter portion of it (beginning with chapter vi.) is essentially practical, and generally well and clearly written.

The first chapter is historical and interesting. Chapter ii. on the "Physiological Anatomy of the Retina," and chapter iii. on "Physics of Light, Colour Sensations," might well have been omitted. They are, we think, of no practical use in a book of the kind, as they deal cursorily with subjects for an intelligent understanding of which much more thorough explanation is necessary.

In the chapter on "Acquired Colour-Blindness" Jennings employs the terms *absolute* and *relative* in reference to the scotoma, in a sense which is different to that in common use. He says—"it [the scotoma] may be *absolute*, blind to light of any kind, or *relative*, blind to colours." A scotoma may be *absolute* to colour though not to form, or there may be a *relative* (*i.e.*, incomplete) scotoma to both form and colour. Again he cites, apparently as exceptional, a case of tobacco amblyopia "in which the patient was able to name and match colours, but would have con-

fused red and green at a distance of one hundred feet, because of the existence of a relative scotoma." If we understand the author's meaning, this feature is by no means exceptional in cases of tobacco amblyopia, and it is one of the reasons why colour-vision testing should be carried out by medical men. A patient suffering from tobacco amblyopia may readily pass the ordinary wool test for colour-vision, and yet be unable to distinguish between red and green railway signal lamps because of the existence of a *central* scotoma for colour.

The book contains a number of useful illustrations and a good list of references to the literature of the subject.

S. C. AYRES (Cincinnati). Lymphangioma Cavernosum of the Orbit. *Trans. of the Section of Ophthalmology of the American Medical Association*, 1895, *p*. 211.

This paper which, on account of the absence of its author, was only read by title at the meeting of the Association, appears in the published volume of the transactions of the section. It records an original case of this rare form of tumour, with abstracts of cases previously reported.

Dr. Ayres' case occurred in a man aged 53, with good personal and family history, except that one sister had died from a malignant growth. He came with well-marked proptosis of the right eye, which had been coming on for about three years. This eye could count fingers at three feet. There was marked optic neuritis. The motion of the eye was not impaired. It was impossible to detect any growth round the rim of the orbit. The diagnosis given was a probable sarcoma, beginning at the apex of the

orbit. He was next seen six months later. The tumour had grown very considerably, the eye standing about eight millimetres in advance of the plane of its fellow. Motion upward was limited, and the eye diverged, as if pushed out in the axis of the orbit. The optic disc was very considerably swollen, but vision was $\frac{2}{10}$. Within a few weeks he had three attacks of severe pain in the head lasting several hours, with tingling sensation in the right side and some delirium. There had also been at times marked mental hebetude. Numerous polypi had been removed from the nose in the year preceding, but there was no evidence of a malignant growth there. There was no evidence of a growth in the orbit from palpation, nor was there any bruit or pulsation.

On division of the external rectus, exploration with the finger showed a large elastic tumour within the muscular funnel. The optic nerve was on its anterior surface, and put greatly on the stretch. The globe and tumour were enucleated together. The growth filled the bony orbit so closely that there was some trouble in detaching it. The optic nerve was severed at the very apex of the orbit. Macroscopically the tumour presented a whitish appearance, and was firm but elastic. The optic nerve was attached to it by bands of connective tissue. It measured 35 mm. in length, the diameter at the outer end was 22 mm., and that of the inner end 13 mm. Its section showed many small cavities. Microscopically the tumour was for the most part composed of lymphoid cells, both large and small; the cavities were lined with an imperfect layer of endothelium, and within these cavities were numerous lymphoid cells lying loosely. There were no traces of bloodvessels, and no evidences of glandular formation. Lymph vessels were numerous and large, and the larger ones lined with a perfect layer of endothelium.

A search for previous reports of similar cases has revealed two in *Graefe's Archiv*, one reported by Foerster (vol. xxiv., 2, p. 107), and one by Wiesner (vol. xxxii., 2, p. 205). Ayres is also inclined tc regard Dunn's case (OPHTHALMIC REVIEW, 1894, p. 167) as of this kind. But

to the reviewer it seems that Dunn has properly placed his case in a group which, though somewhat related to it, is quite distinct from the group under consideration.

In Foerster's case the man had a steadily growing protrusion of the eye for ten years, but could still see movements of the hand at twelve inches' distance. The skin of the lid was red, the veins varicose. The globe was strongly abducted and with difficulty pressed backward. Movements of the globe were greatly interfered with, especially upward and inward. Palpation of the inner side of the orbit gave the sensation of a soft, slightly movable, nodular tumour. Pulsation was distinct, no bruit. There was white atrophy of the optic nerve, with vessels but slightly filled. The growth enucleated with the globe was found within the muscular funnel to the inner side and below the eye. It was 37 mm. long and 35 mm. broad. It was permeated by spaces of various sizes containing numerous lymphoid cells but no blood discs, and lined with endothelium. The walls of these spaces were layers of connective tissue and contained large quantities of elastic fibres and blood vessels.

Wiesner's patient was 43 years old, and came on account of a tumour of the lower lid. For two months there had been diplopia. There was complete loss of function of the inferior rectus. Between the globe and the lower outer edge of the orbit was a smooth, hard, ovoid, movable swelling the size of a hazel nut. There was no exophthalmos. The growth was removed through an incision along the lower edge of the orbit, being loosely attached. It was covered with a thin fibrous sheath, was cavernous in structure, and a serous fluid escaped on opening it.

Cavernous tumour of lymph vessels gives no distinctively characteristic picture; but it lacks the spontaneous, or mechanically induced, increase and diminution of the swelling that is seen in cavernous tumours of the blood vessels; and because of its more unyielding character, it causes greater interference with the function of the orbital muscles. Lymphangioma cavernosum of the orbit is probably rare. But it may not be so rare as appears

from the literature. None of the reported cases were recognised as of this character until a microscopic examination had been made. Before the enucleation the diagnosis arrived at was one of sarcoma or fibroma of the orbit. E. J.

HEDDÆUS (Essen). Haab's Cortical Reflex of the Pupil in its Relation to the Reaction of the Pupil in Hemianopia. *Archives of Ophthalmology*, *xxxii.*, 2 (*German edition*).

In 1885 Haab made the observation that the pupil of a person looking for some time steadily at an object lighted only by a lamp placed at the side of, but within the visual field of the examined eye, soon shows widening. If then the attention of the person is somewhat suddenly directed to the lamp, without, however, changing the direction of the eye, the pupil first contracts and then oscillates for a short time. Haab interprets this phenomenon as a cortical reflex in this way, that by the stimulation of the attention a renewed excitation takes place at the spot where the retinal image has been for some time, the stimulation being then transmitted by the optic nerve to the cortex, and thence by descending fibres to the third nerve, resulting in contraction of the pupil.

Heddæus seriously questions the soundness of this explanation. To begin with, it has not been proved that the contraction of the pupil is a new reflex, and not the accommodative contraction. This latter is not a reflex at all, strictly speaking, but an associated movement accompanying convergence and accommodation. Moreover, it is caused *indirectly* by the cortex, ordinarily by the visual area.

The explanation of the phenomenon is thus given by

Heddæus. By looking for some time steadily at an object the retina becomes fatigued and ceases to see both the object and the lamp at the side; with the attention also the accommodation ceases, proof of which is shown by the enlargement of the pupil, which is sometimes very considerable. If, then, the attention of the examinee is suddenly drawn to the fixed object, the accommodation is called into play and is accompanied by contraction of the pupil. By this accommodation the image of the lamp at the side is now moved from the fatigued to a fresh part of the retina, without any movement of the eyeball itself, and produces in its turn a new impression of light and a further—this time a reflex—contraction of the pupil. Heddæus, therefore, considers the accommodative movement and contraction of the pupil as the primary, and the visual perception as the secondary, act.

As Haab's pupillary contraction can be effected by any unexpected excitation of any sensory nerve, the sudden appearance in the visual field of some luminous object seems a very suitable mode of producing it. It would, therefore, be possible to utilise this contraction of the pupil for the purpose of detecting the simulation of visual defects, if it were possible to eliminate the oscillations of the pupil, and also if it were not too much dependent on the good will of the examinee.

With reference to the re-action of the pupil in hemianopia, when the various parts of the field of vision are exposed to the action of light the results recorded have been contradictory. If by moving a light into the various parts of the visual field we wish to ascertain whether the blind retinal halves have lost their reflex sensitiveness as well as their subjective sensitiveness to light, we must not forget that we cannot exclude Haab's "attention" reflex as soon as the light reaches the intact retinal half. This attention reflex is an uncertain quantity depending on various circumstances. It will be totally absent in patients who are completely unconscious; it will perhaps be very marked in semi-conscious patients with open staring eyes; and it may vary in one and the same individual according

to the mode of procedure and the repetition of the experiment.

The "cortical" reflex will be noticed in all cases where a perceptive part of the retina is consciously excited by light and is followed by an accommodative impulse due to the secondarily excited attention; but it will not occur when a blind part of the retina is lighted up. It has been found that the seat of the lesion causing the blindness has nothing to do with this—whether it be situated in the retina, in the peripheral part of the optic nerve, the chiasma, the tract, the central ganglia, or the occipital cortex.

When, therefore, in cases of hemianopia a contraction of the pupil follows as soon as the image of a light is brought from the blind to the seeing half of the retina, it will be necessary to ascertain whether this contraction is a pure reflex produced by the light, or whether it is due to Haab's "cortical" reflex. None of those observations which have been made hitherto without taking this point into account, can claim any scientific value at all. For this reason Heddæus suggests the following mode of examination:—

The patient is placed in a dark room; one eye is covered while the other is directed steadily and attentively to some well-defined object one or two yards off, while two equally bright lamps are placed symmetrically in the two halves of the vision field and alternately obscured. When the object was steadily looked at, Heddæus succeeded in eliminating completely the hemianopic pupillary re-action.

K. G.

LUDWIG BACH (Würzburg). Remarks on Dr. Ahlström's paper "On the Antiseptic Action of Tears." *Archives cf Ophthalmology*, *xxxii.*, 2 (*German edition*).

It has only recently been proved that the human body is capable of effecting a sort of auto-disinfection or auto-antisepsis by producing substances which have a destructive action on micro-organisms. Amongst these substances must be reckoned the secretions of various glands and mucous membranes.

Edinger has proved the disinfecting properties of saliva to be due to its containing sulpho-cyanate of potassium—a salt easily acted upon by weak acids, especially by HCl. Sulpho-cyanic acid is thereby set free, and combines with the basic substances in the saliva, producing sulpho-cyanates, to which the strongly-disinfecting power is due. It was found that a broth solution of sulpho-cyanates of $5\frac{0}{00}$ (5 per 1,000) destroyed cholera bacilli, a solution of $1\frac{0}{00}$ diphtheria bacilli, of $15\frac{0}{00}$ staphylococcus pyogenes aureus, all within one hour.

The destructive effect on bacteria attributed by the author and Bernheim to the lacrymal fluid has been doubted by Ahlström, in consequence of a series of experiments made with the secretion from a lacrymal fistula, and from cases of phlyctenular conjunctivitis. In all these experiments, however, the number of germs used has been very great; in three experiments, with a comparatively small number of germs, destruction of the micro-organisms was well marked.

Ahlström is inclined to believe that the bactericide influence of the lacrymal fluid is related to the degree of its alkalinity—the weaker the alkaline reaction the greater being the destructive power of the lacrymal fluid—a supposition which does not command a ready acceptance, considering that the alkalinity of the tears cannot vary within very wide limits.

Bach, therefore, made a number of experiments with saline solutions containing nearly the same percentage of

saline constituents as the lacrymal fluid — chloride of sodium 1·0%, sodium carbonate 0·1 to 0·2%, sodium phosphate 0·05%, magnesium sulphate 0·05%. Such a solution is strongly alkaline, and it was observed that staphylococci perished in it much more quickly than in the lacrymal fluid.

From these experiments Bach concludes that the sterilising effect of the lacrymal fluid is not only due to its not being a nutritive medium for micro-organisms owing to the absence of organic substances, but also to some positive destructive agency, due either to some of its constituents or to some chemical action.

The author further corroborates the view that bacteria are removed mechanically from the conjunctival sac by the current of tears produced by the movements of the lids and passing through the canaliculi into the nose. An infection of the conjunctival sac from the nose thus appears impossible so long as the lacrymal passages are in a normal state of function. K. G.

H. V. WÜRDEMANN (Milwaukee). **Influence of General Nutrition upon the Course of Ophthalmia in the New Born.** *Annals of Ophthalmology and Otology*, 1896, *p.* 44.

Würdemann points out that the state of general nutrition is a recognised element in all local or general affections, and is especially noticeable in the infectious diseases. Where tissues do not receive the proper nourishment through defective assimilation, insufficient or improper food, or deficient local nutrition, they do not afford the usual resistance to infective germs and their toxines. The efforts of some writers to secure the adoption of efficient

preventive measures might lead to the impression that ophthalmia neonatorum or its sequelæ are in all cases preventable. He reports three cases which, in spite of good treatment begun early and efficiently carried out under the care of physicians of ability, and which under ordinary circumstances would have resulted favourably, had, owing to poor assimilation, been followed by serious implication of the corneæ and resulting blindness.

In the first case the child, born at the full term, was noticed to have sore eyes on the fourth day, and placed under appropriate treatment. It did well until it was three weeks old, and the family was informed it would soon be well. But at the next visit the corneæ were found hazy. Four days previously the mother had developed gastro-enteritis, her milk was less in quantity, and thinner. The baby had been immediately affected, had colic, and was very restless after nursing, and lost flesh for a few days; then it recovered. The discharge from the eyes was scanty, but without ulceration; the corneæ gradually became more opaque, and the child was discharged with partial staphylomata and leucomata. The parents denied gonorrhœa, but the mother had long suffered from leucorrhœa.

The second case was of a child prematurely delivered at seven months. The eyes became affected on the fourth day. It was seen on the seventh. There was muco-purulent discharge, but the corneæ were intact. Under silver nitrate, and other efficient treatment, the discharge rapidly abated. The mother had suffered from leucorrhœa and ovarian disease, and was unable to nurse her child. At the fourteenth day it weighed less than at birth, and the corneæ were becoming opaque in a striated manner under the epithelium, beginning from the centres and extending toward the limbus. They afterwards got into a condition of kerato-malacia; the child died of inanition on the twenty-first day.

The third case was not seen until three weeks of age. The discharge had commenced at the third day, and it had been under treatment since, but not with silver nitrate.

The discharge was purulent and creamy, but there was no ulceration. The parents had acute gonorrhœa. Three days after the child was first seen the mother developed fever and her milk stopped, and from this time she had elevation of temperature and rheumatic pains. The child did badly on artificial foods. By the thirtieth day the discharge was very slight, but one cornea was noticed to have a pearly lustre. The next day it was seen to be infiltrated, the infiltrations converging from the limbus toward the anterior pole. The other eye soon followed in the same course, the anterior epithelium remaining intact for two weeks, but then coming off like a piece of exfoliated epidermis. By the seventh week both corneæ had become staphylomatous. The child gradually grew more feeble, and died in the thirteenth week.

Würdemann thinks that cases properly attended certainly occur, in which other factors than that of the specific inflammation obtain, and which should modify our prognosis. Such cases may occur in the practice of any physician, and invidious criticism might arise if the public or profession believe that, by proper treatment given sufficiently early, blindness may in *all* cases be prevented.

E. J.

A BINOCULAR MAGNIFYING LENS FOR EXAMINATION OF THE EYE BY OBLIQUE ILLUMINATION.

By Edward Jackson, M.D.

Professor of Diseases of the Eye in the Philadelphia Polyclinic.

To persons accustomed to binocular vision, the study, by monocular vision, of unknown conditions of the anterior segment of the eyeball, is at first attended with appreciable difficulty and a sense of baffling. With practice the difficulty diminishes and is no longer noticed ; but probably the appreciation of the thing looked at is never quite so ready or complete with monocular as with binocular vision. I know surgeons who on this account rarely employ the ordinary magnifying lens, but who habitually resort to a pair of strong convex lenses, or a large reading glass when any unusual or especially puzzling appearance is to be studied by oblique illumination, such arrangements allowing both eyes to participate in the examination. They prefer the impression gained by binocular vision, although with the monocular magnifier they would obtain a much larger image.

The obstacle to using a strong convex lens, large enough for binocular vision, is spherical aberration, with the distortion and indistinctness it causes. Even with a plano-convex lens with the curved surface turned from the object, only that part about the centre of the

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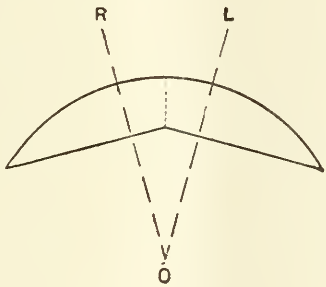
surface corresponding to an angle of about twenty degrees, measured from the principal focus of the lens, is sufficiently free from distortion to allow of useful vision through it. Now if the visual lines are converged to a point six or seven inches from the eyes, they make, one with the other, an angle of about twenty degrees. They pass through opposite margins of the available visual zone of the lens. With the visual lines in this position the right eye can see with little distortion only the part of the object to the left of the point fixed, the left eye can see only the part of the object to the right of the point fixed, and binocular vision is impossible.

To meet this difficulty I have used two lenses placed side by side and so joined that the visual line of the right eye pierces the right lens near its optical centre, while the visual line of the left eye pierces the left lens near its optical centre. This gives each eye an undistorted field all round the point of fixation, and these fields can be combined in full binocular vision. To reduce distortion as much as possible, these two lenses have been set at such an angle that their surfaces will be approximately perpendicular to the visual lines piercing them.

For most of these lenses that have been made up to the present time, the two halves have been ground as separate lenses and cemented together; but recently Messrs. Wall and Ochs, of Philadelphia, have succeeded in grinding the whole lens out of a single piece of glass, the one surface being spherical, and the other surface consisting of two planes meeting each other at the proper angle. The junction of these planes it is impossible to make absolutely sharp and true; yet it can be made sufficiently so to answer all practical purposes. Necessarily in such a lens a certain inclination of the planes gives a certain amount of decentering. An inclination of the planes one to the other of twenty degrees, gives a decentering, for a 40 D. lens, of a little over two

millimetres ; while for a lens of half that strength the distance of the decentering is twice as great. When the angle between the planes is thirty degrees the decentering is about 50 per cent. greater. From twenty to thirty degrees is found to be the proper inclination. With the greater angle and greater decentering, the available undistorted field is larger. With the lesser decentering, lesser angle, it is easier to fuse the two images and secure binocular single vision. The figure represents a section of such a lens with the visual lines R O and L O piercing the lens at the respective optical centres and meeting at the object O.



When the lens is made of two pieces ground separately and cemented together, it is possible to combine any desired amount of decentering with any given inclination of the surfaces. But the proportions given above cannot profitably be greatly departed from. The greatest gain is in the way of slightly greater decentering, as compared with the inclination of the surfaces. For a 20 D. lens a good proportion is a decentering of six millimetres (measured on the convex surface) with an inclination of twenty degrees.

The special advantages derived from the use of such a lens as I have here described are : The distinct perception of the relative depth of the things seen, which

is only to be had through true binocular vision, and the increased vividness of the impression secured when both eyes are in use. The perception of relative depth is very clear and exact, on account of the comparatively large angle at which the visual lines meet. This is in strong contrast to what is observed with the monocular magnifying lens, which, by the enlargement of the image in the plane perpendicular to the visual line, makes judgment of the relative depth of points looked at more difficult than with the single naked eye.

The value of the increased vividness of the impressions obtained by the use of both eyes over those obtained through a single eye, is more important than may at first appear. With a single eye one has, in a good light, a satisfactory power of recognising familiar objects ; but with feeble illumination, or for the recognition of unusual or unfamiliar appearances, the superiority of binocular vision is considerable.

The attainment of binocular vision through such a lens is at first difficult, often surprisingly difficult ; but when fairly mastered it is used with about as much ease as the ordinary monocular magnifier of the same strength. Its early use will be easier to acquire if one begins with a rather weak lens, say 20 D. It must be held so that the point fixed will be seen by each eye through the optical centre, or a little to the outer side of the optical centre, of the corresponding half of the lens. Whether this condition is complied with can be tested by alternately closing first one eye and then the other.

The junction of the two lenses, or of the two plane surfaces if the lens is made of a single piece, must be kept parallel to the median plane of the head, otherwise the visual line of one eye will pierce the lens above its corresponding optical centre, while the visual line of the other eye pierces it below the other optical centre, and the vertical prismatic effect so encountered will prevent the proper fusion of the two images for bino-

cular vision. Since with a strong lens a very slight departure from the optical centre causes an appreciable prismatic effect, this position of the lens must be carefully attended to.

The lens must be so held that its two parts are about equally distant from the point looked at. Any inclination of the lens, causing marked inequality in the distances of the two portions, interferes with binocular vision by inequality of the size of the two images that have to be fused, and the distortion of aberration consequent upon such obliquity.

In beginning an examination with it the lens should be brought rather close to the object, and the surgeon's eyes rather close to the lens, where strong convergence will be needed. After binocular vision has been secured in this position, the lens and the surgeon's eyes should be withdrawn to greater distances, where the fullest magnification of the object can be obtained, and without excessive exertion of convergence. For instance, to begin with, the 20 D. lens may be placed three-fourths of an inch from the part to be examined, and the surgeon's eyes five or six inches from the lens ; and when the binocular fusion of images has been effected the lens may be withdrawn to nearly two inches, and the surgeon's eyes to a distance of ten or twelve inches from the object.

Part of the first difficulty in using the lens comes from the tendency to look through both halves of the lens with one eye. This can be obviated by holding a card on the side of the lens toward the surgeon, perpendicular to the lens surface along the line where the two halves of the lens join. This will prevent either eye from seeing through the half of the lens belonging to the other eye.

OPERATIVE TREATMENT OF ENTROPION AND TRICHIASIS.

By James W. Barrett, M.D., F.R.C.S.
Surgeon to the Victorian Eye and Ear Hospital.

In the last December number of the Ophthalmic Review there appears an article on "The Operative Treatment of Entropion and Trichiasis," from the pen of Mr. J. B. Story, which virtually amounts to a criticism of Mr. Kenneth Scott's operation for trichiasis published in the Review for September, and the description of a method adopted by Mr. Story himself. His article is interesting, and I feel tempted to recount briefly my own experience.

Entropion and trichiasis are frequent diseases in Australia owing to the prevalence of neglected and severe trachoma. In fact, if there is one disease of the eye more than another which characterises Australian practice, it is the "sandy blight" which does so much damage in the country districts, especially during the long and dry summer. The circumstances of the agricultural population are such that the disease is neglected or treated irregularly. The natural result is a plentiful crop of entropion and trichiasis. During the last ten years my own practice with respect to the operative treatment of this condition has undergone many changes. After a good deal of speculative operating I settled down to the performance of Van Millingen's operation as giving on the whole the best results and proving itself a fairly reliable and certain method. The exact method by which the mucous membrane was sewn into the fissure varied a little. I fancy that most operators differ a little in this part of the operation, but that by the way. At the Intercolonial Medical Congress held in Sydney in 1893, Dr.

Evans, however, described a method which he had then adopted for some time past for the treatment of in-curved lashes. On my return to Melbourne I put his suggestions into practice, and have since then performed no other operation. It is effected as follows :—The lid is split in the ordinary manner, as for Van Millingen's operation, along the whole border of the eyelid, or only a short distance if the incurving of the lashes is but partial. The incision is placed well behind the roots of the cilia and is carried up into the substance of the lid a distance of from 4 to 6 mm. A second incision is then made through the skin on the outer surface of the lid at a distance of from 2 to 4 mm. from the point of emergence of the lashes. This incision is continued parallel with the edge of the lid so far as the in-curving extends—that is to say, the whole length of the lid if the trichiasis is general, only a portion of that distance if the trichiasis is partial. This incision is carried down to meet the other, so that the edge of the lid from which the lashes are growing is then completely detached, except at its ends. But the incision is not taken horizontally backward ; it is carried upward and backward, so that it joins the other at an acute angle. We have, then, the portion of lid containing the lashes attached only at its ends, but with its upper margin wedge-shaped. The next step consists in the rotation of this piece so that the edge from which the lashes spring is applied to the upper lip of the skin incision, the lower lip being pushed backwards into the wound. This rotation can easily be effected by sutures passed from the lower margin of the detached portion to the upper margin of the skin incision. The sutures are tied and the operation is complete. I have usually dressed the eye with iodoform ointment and a large pad of dry absorbent wool. There is some danger of sloughing if there is any carelessness in the after-treatment, but I have never had a disaster except in one

case, in which the patient tore off the bandage, tore out the sutures, and tore away a portion of the lid.

When first performing the operation I was apt to make the bridge very narrow, fearing that I should produce too much eversion or have too much difficulty in effecting the rotation. But the narrower the bridge, the greater the risk of sloughing, and after one or two warnings I have used a wider bridge with no bad results. Occasionally it becomes necessary to make a small skin incision after cicatrisation to release lashes which have become entangled in the scar ; beyond this I have seen little or no difficulty. The advantage the operation shares with that of Van Millingen is the absence of an attempt to counteract an inward pull by an outward pull. It is simply a means of altering the position of wrongly placed lashes, and so far as my experience has gone, it has been just as successful as Mr. Story's operation, the results of which he describes as having been "almost uniformly perfect." It has, however, the great merit over any method of transplantation, in being very simple and easy to perform. Van Millingen's at best is a tedious and unpleasant operation, involving considerable inconvenience and loss of time ; this effects the same result with a minimum of either.

I am quite prepared for the remark that this is one of a new crop of operations for entropion and trichiasis which are being invented and practised. When the operation was first described at the Congress by Dr. Evans, I was just as sceptical of its value as any of the readers of this article are likely to be. I hope that they will enjoy my experience.

HERMANN WILBRAND (Hamburg). The Restitution of the Field of Vision under Normal and Pathological Conditions. *Centralblatt für Augenheilkunde*, *May*, 1896.

In the book under consideration—for the article in the *Centralblatt* is a review of a book of 180 pages—Wilbrand, to whom we are indebted for much good work on the subject of the field of vision and its anomalies, endeavours to found upon a physiological basis the concentric fatigue-contraction of the field. He considers the clinical symptoms of a purely functional lesion to be due to certain processes in the retinal tissues, and endeavours to discover in what manner the field of the fatigued eye proceeds towards recovery. The author starts with the assumption (Hering) of perception by a process of dissimilation (D) of the visual substance in the cones, the stimulus is conveyed to the cortex and perceived as light; on the other hand, in the parts of retina protected from light a restitution of this substance, or assimilation (A) takes place, the psychical effect of which is an impression of darkness; the chemical preparation of this substance takes place in the rods. The effect of brilliant illumination is that the dissimilation process is so active that assimilation cannot compete with it, and the visual substance is used up at the close of the period of stimulation. The use of Förster's photometer will show most conclusively the fact of the exhausted state of the retina. In order to test the individual portions of the retina as to their exhaustion, the field of vision should be tested immediately on the conclusion of the stimulation exposure, in absolute darkness, the fixation and test objects only being illuminated by a candle, and daylight rigidly excluded; the test objects are pieces of paper 1, 2, or 5 mm. in diameter. For the sake of simplicity only the horizontal meridian was examined; for the normal eye the field of visibility of a 1 mm. object extends from 60° at the nasal to 90° at the temporal side in this meridian. In diffused daylight the generally fatigued normal eye shows a normal

extent of field by reason of the richness of the supply of A-material, but the field when taken in the special manner indicated above (for the details of which one is referred to the original paper) shows recovery curves very interesting in their proof that the retina after fatigue recovers from macula towards periphery. The central parts recover rapidly, the more peripheral less quickly, the slowest to recover is the extreme temporal region. The author considers this to be explained by the anatomical condition of the retina, for the cones, very numerous in the central area of the retina, become fewer and fewer towards the periphery. These observations, made with a moving test object, agree also with those of Aubert, which were made with a stationary test object. Further investigation proves that light falling upon a certain portion of the retina—say the macula—depresses the whole retina; that the macular region can become somewhat strongly depressed and recover partially, this reduction of power of the macula showing itself as a relative scotoma for small feebly-illuminated test objects; this relative scotoma becomes smaller concentrically, the fovea itself being the last portion to recover; further, that macula and fovea, although this is true, recover more quickly than the most peripheral portions of the retina; lastly, that the "blinding" of one eye has absolutely no influence on the value of the other if it has been kept covered during the experiment. With regard to the influence of these conditions of restitution of visual substance upon colour vision, the following points are of importance: Colours are not perceived at the fixation spot by a fatigued eye in partial darkness; the colour-blind zone at the periphery of the field increases in size with the fatigue of the eye; that in slight darkening the reduction of the various colour fields is somewhat changed, inasmuch as in the fatigued eye the limit for red is wider than the limit for blue; and lastly, that with similar illumination the field for blue in the much fatigued eye approaches that for red, which forms apparently a characteristic sign of fatigue. Having obtained so much information regarding these points, the author proceeded to try to

discover any physiological explanation of certain hitherto unexplained visual disturbances, notably the so-called nervous asthenopia. The nervous eye shows in the slighter degrees, along with fatigue-constriction of the field, a diminution of light sense which is proportionate to the degree of reduction of the field. Also the nervous eye in which there is a high degree of this restriction of field, exhibits in the dark chamber a tendency to a recovery expansion of the field, only the recovery proceeds much more slowly than in the normal eye: but yet the field of vision of the same individual who in ordinary daylight exhibited signs of a functional nervous lesion, may in the darkened chamber recover normal limits.

In consequence of the analogous condition produced in a normal eye much fatigued by the shining of bright light upon the whole retina, we are enabled to come to the conclusion—and this is one of the chief points in Wilbrand's book—that in the nervous eye one has to deal with a depression, a fatigue, a using-up of visual substance, a lesion lying more deeply than in the normal eye fatigued by the action of external illumination. With regard to colour fields, also, the nervous eye exhibits an analogy to that of the over-fatigued normal eye, inasmuch as the field for red, according to Charcot, may in hysterical patients be found to be co-extensive with, or even greater than, that for blue. For the account of the effect of this fatigue upon central vision, reference must be made to the original paper, but the symptoms are, in the writer's opinion, referable to the "hunger" for the visual substance used up by the action of light. Among the causes for this demand for restitution of visual substance (A substance) not sufficiently replaced, the author places abnormal constituents of the blood, as in chlorosis, marasmus, convalescence from severe illness, chronic intoxication (by alcohol, morphia, &c.); and further, local causes in the form of inflammations of the outer layers of the retina and of the choroid, as well as interference with blood current and lymph supply, and inhibitory influences acting on the centrifugal visual paths. These last may act through the

centrifugal fibres arising in the anterior corpora quadrigemina and external geniculate bodies, and which end in the cones of the retina, but concerning whose action one knows absolutely nothing for certain. The influence which they exert may not be by way of the vasomotor paths, but rather in an analogous fashion to the nerve supply of glands. The amblyopia "by suggestion" and the hysterical amaurosis have nothing in common with the described concentric restriction of the field as observed in nervous asthenopia; they exhibit rather a purely psychical form of "non-vision," while the symptoms of nervous asthenopia, so far at least as they relate to the altered reaction to light, must be located in the external retinal layers, and may be modified or influenced by various causes. These symptoms, above indicated, of purely functional nervous visual lesions, are in agreement with those presented by some cases of atrophic conditions of the nerve during the earlier stages. On account of this fact it may be difficult to diagnose between a true organic lesion and a functional condition. It is worthy of notice that in the former case, if there are lasting changes in the field of vision, sooner or later the ophthalmoscope shows abnormalities of the papilla, while the type of field in the latter case is the universally contracted one. There are neither central, para-central nor peripheral scotomata to be observed for any length of time, as so often happens in optic atrophy; again (with the exception of ocular migraine, a condition which has nothing to do with the matter in hand) hemianopsia is never present in functional cases; and lastly, the particular limitation of the colour fields exhibiting the peculiarities described above is another point of distinction.

The author also discusses the behaviour of the D and A processes in acquired and congenital night blindness. For the first, as Förster has shown already, there are certain pre-requisites in the form of peculiar conditions of the blood and circulation, but for the majority of the cases there must have been a prolonged exposure to bright light. This symptom finds its explanation in the same

way as is shown in the above experiments in a too great activity of the D process, or inefficiency of the A process, which is unable to supply with the required rapidity the material used up in the D process. On exposure to too bright a light, as by the direct rays of the sun, the excitable substance in the cones of the retina is destroyed by the energy of the D process, and a permanent scotoma may result. In a similar way one can explain the acquired night blindness of syphilitic choroido-retinitis, disseminated choroiditis, pigmentary atrophy of the retina, retinitis pigmentosa and detachment of the retina; the D substance can proceed unrestricted in the cones, but the A process may be prevented, and by its being closed in and shut off by inflammatory products, the consumption of the products not being completed, a positive scotoma may result. The congenital, bilateral, incurable "hemeralopia," on the other hand, has its seat in an interference with the D process, in that the visual substance is less easily broken up than in the normal eye. The book, clearly written and embellished with numerous instructive field of vision charts, &c., offers new and interesting points of view, not merely from a theoretical, but from a practical and therapeutic standard.

W. G. Sym.

H. MAGNUS (Breslau). The Microscope-Mirror (Loupenspiegel). *Festschrift für Prof. Foerster*, 1895, *p.* 54.

The method hitherto employed for the examination of the living cornea and lens by the help of magnifying glasses has generally been that of oblique illumination. In the microscope-mirror as used by Magnus, transmitted light is employed in the same way as in the microscope. It is in principle nothing but the ordinary ophthalmoscope with a strong convex lens behind the perforation; its methodical application, more than the construction of a special instrument, is the merit of Magnus.

The instrument itself consists of an ophthalmoscope in which the simple lens behind the central hole is replaced by two convex lenses held by a frame so that they may be changed to form various combinations. The combination of two weak lenses has the advantage over one correspondingly strong one that there is less spherical aberration. The mirror itself is plane, so as not to destroy delicate details by too strong illumination.

According to Magnus's own account, the use of the mirror is difficult owing to the various distances at which the details to be investigated lie. In using it he recommends occasional tilting, so as to throw the light in various directions. It is further advisable to direct the light towards the optic disc, as the reflex from it is whiter than from any other part of the normal fundus. In order to keep the surface of the cornea free from mucus and other particles, a weak solution of boracic acid may be applied to the cornea before and, if necessary, during the examination.

The results obtained thus far by the use of the instrument are sufficiently important to warrant its more general use. In the first place the method renders the minute structure of cornea and lens accessible to direct inspection during life. In the preparation for ordinary microscopic examination the lens undergoes a variety of changes affecting its hardness, colour, elasticity, and form, and so may be altered to

such an extent that any conclusions drawn from its state may be of no value as regards the living lens. It is here that the mirror fills a gap in our knowledge.

This is particularly the case in studying the different phases of the development of cataract, the mirror admitting of a series of examinations at various periods, while the microscopic examination takes place at one stage only. In this respect the investigations into the formation of cataract in animals by feeding them with salt, sugar, and naphthaline, have proved the value of the instrument. It was found that the early stages of diabetic cataract closely resemble those of myopic cataract, while a great likeness exists between the naphthaline cataract and that produced by the tying of the vorticose veins, and to a certain extent also senile cataract.

Magnus points out that the proper examination of the pathology of cataract will have to begin in future, not with the examination of the already opaque lens, but with the lens apparently still normal, and that periodical examinations will have to be made until the first occurrence and subsequent progress of the opacities are sufficiently well observed and known. Similarly, the influence of various diets or special articles of food, as, for instance, sugar, on the normal lens will have to be studied; only in this way can a satisfactory knowledge of the process and progress of the formation of cataract be gained.

K. G.

E. JAVAL. Strabismus, a Manual (*from Centralblatt für praktische Augenheilkunde, May*, 1896).

In this handbook Javal gives in a condensed form the fruit of his experience of the observation and treatment of strabismus.[1] He deals briefly at the outset with the refractive anomalies present, and is inclined to consider that astigmatism plays a very important part in the production of squint. And he lays down the proposition that nearly every case of squint may be cured, even such patients as have false projection or have lost the fixation power of the deviating eye, but to attain this end a great expenditure of labour and trouble may be required.

The first portion of the book proper contains an exposition of the theories in regard to binocular vision. According to Javal, we unite into one image the pictures falling upon corresponding points in the two eyes in virtue of the experience which may be partly hereditary in origin, partly developed in the earliest infancy. The relation of the corresponding points is established by the fixation points which form a small spot in the more extensive area of most acute vision.

Under unaccustomed conditions, for example when a prism is placed before one eye, our ordinary experience leaves us in the lurch and we have double vision. Slight obstacles are overcome by reason of the strong desire which we have for single vision, which enables us to suppress or discount observations inimical to single vision. On the other hand, physiological double vision contributes to our knowledge of relief or of distance, for all parts or objects situated nearer to us than the object fixed must give us crossed diplopia, while those further away give homonymous. This fact must be of great use to us in our estimate of distance and relation of objects. The precise degree of relief is estimated by the amount of movement of the eyes required to fix them both on various points of the object. The *rôle* of accommodation

[1] See also vol. xi. of the OPHTHALMIC REVIEW (1892).

in estimation of relief must—says Javal—be but meagre, since in the stereoscope we have a perfect idea of perspective while accommodation is entirely in abeyance. He remarks also that the relation between accommodation and convergence, very close as a rule, must be very easily interrupted, as one is in a position to fuse the pictures in the stereoscope by vigorous accommodation without convergence, and apart from the instrument without accommodation, but with convergence. Javal, having discussed certain other theoretical points, proceeds to the question of squint proper. Three points have first to be considered: (1) the nature of the deviation; (2) whether binocular vision is retained even within a small area; (3) whether the deviating eye still possesses fixation power. We must distinguish between the constant element of squint which remains for all distances, and the variable portion. The precise actual degree of squint is of comparatively little moment, for the operator can vary this at will, and in regard to optical treatment is not of great value. The performance of the operation is of much importance in the treatment of squint, more especially as the patient may from want of time have to content himself with a correction, which is only *apparent*, for the processes for the restoration of binocular vision may have to consume a great deal of time, and in a certain proportion of cases such restoration is impossible owing to the gravity of the defect in the deviating eye.

The time for the operation ought to be chosen according to the question whether restoration of binocular vision is or is not aimed at; if the latter, we ought to under-correct a convergence and over-correct a divergence; in the former case an over-correction favours the development of double images whose existence is of material help in the optical cure of strabismus.

If hypermetropia is present, correcting lenses are ordered, and these in a number of cases are of use in assisting to bring about a cure, and may accomplish it of themselves. In anisometropia, Javal orders glasses which are also unequal, assisting the deviating eye and reducing the other.

The usefulness of prisms is decidedly limited; stereoscopic exercises probably are of as much benefit as the weak prisms, which alone can be of value. Squint-spectacles (*Schielbrille*) are much more useful; they strengthen the squinting eye while the other is excluded from seeing, and help to put a stop to suppression of the image. If the two eyes are very unequal in visual power, the good one may require to be incessantly excluded from vision for months, until the visual acuity is approximately equalised; then closure of either eye alternately should be kept up for a time. In a patient under the age of 5 or 6 years this method of treatment is the only proper one; even if persevered in for a long time it can do no possible harm, but transitory [apparent (?)] increase of astigmatism may occur. If these spectacles are to do any good at all, the shading of the good eye must be absolutely uninterrupted. In addition, exercises in binocular vision without any instruments are of value; the idea in them being to bring about an increase in the area within which there is binocular vision already. These exercises are carried out by (1) slight movements of the head; (2) movement of the body towards the object; and (3) movement of the fixation object.

Of yet greater value is the reading lesson (*Controlirte Lectüre*); this is carried out thus: the patient holds in front of the book a shortish non-transparent object, such as a pencil, in a position at right angles to the plane of the face, and reads. Some of the print must be read (for he is not allowed to move the head) with the right eye, some with the left, and some binocularly. This lesson must be diligently practised.

A large section is devoted to the discussion of the stereoscopic exercises which Javal recommends. He employs for the most part a "Stéréoscope à cinq mouvements," of which both eyepiece and objective are movable in different directions. He begins work with it in the following fashion: a simple object is placed in the middle of the visual field of the sound eye as a fixation point, while another is so placed before the misdirected eye as to fall in

with its visual axis. If by this means fusion of the images is attained, he next moves the latter object by little and little till it occupies the central part of the field of vision, and as this proceeds the position of the misdirected eye gradually rights itself. One of the sets of cards for the stereoscope is specially adapted for this exercise, representing, as each combined picture does, objects situated at different distances. When, by degrees, success has been attained with this test, the patient is made to fuse the pictures in a different set of test objects, viz., letters of varying size—the smaller the letters the more difficult is the exercise. Then the whole line has next to be fused in binocular vision, and in this test careful precautions have to be taken against deception by suppression of one image. If he fails with the above stereoscope, Javal proceeds to employ a mirror stereoscope with movable sides.

The aim set before him in all these methods of examination and exercise may be said to be threefold: (1) the restoration of diplopia, or in other words, the putting an end to the suppression of the false image, for until this is done it is manifest that stereoscopic exercises are utterly useless; (2) the correction of the deviation and the combination or fusion of the two images; (3) the establishment of a correct relationship between accommodation and convergence. For the first purpose, operations and exercises with and without the stereoscope are useful; for the second, one ought to employ the stereoscope, and that as early as possible. We ought, however, to proceed cautiously in the endeavour to enlarge the area of binocular vision in order to avoid the danger of the return of suppression of the second image. The proper relation between accommodation and convergence is brought about usually along with these exercises; the reading exercise described above is particularly useful, and the "squint-spectacles" and stereoscopic exercises assist.

A difficulty in dealing with young children is to select a suitable time for beginning. The more recent the lesion, the more rapid the cure; but the older the child, the more attentive and careful is he in the exercises. In recent

permanent strabismus early operation is indicated; but in other conditions—at any rate up to the sixth or seventh year—squint-spectacles should be employed. An attempt may be made to correct by means of convex glasses, but this should not be carried on too long if a good result is not early attained. Provided the child be old enough, the stereoscopic exercises should be begun; or it may be operated on first and then "exercised." In adults, since the condition is usually of old standing, we have usually to be content with optical correction and an apparent cure.

In the way of after-treatment, the exercises, especially the "reading lesson," should be kept up. Recurrences are rare.

W. G. Sym.

H. Knapp (New York). A Case of Cavernous Angioma in the Depth of the Orbit, removed with Preservation of the Eye. *Archives of Ophthalmol., xxv.*, 1.

The rarity of cases such as this warrants its publication.

Benign tumours causing exophthalmos have only comparatively seldom been removed from the depth of the orbit, without excision of the globe, but Knapp holds that, more often than one would think, operations have proved the error of assuming that the eye must necessarily be sacrificed.

There is always some difficulty in localising precisely deep orbital growths, and one of the lessons taught by the subjoined case, and emphasised by the author, is the importance of carefully exploring the parts before con-

demning the eye to be removed with the tumour lying behind it.

The following are short notes of the case :—C. S., aged 39, a farmer, consulted Knapp in November, 1895, about the condition of his right eye. Twelve years before, he thought this eye was failing, and consulted an oculist about it, whose note, however, shows that at that time there was nothing unusual detected in either eye. The external appearance was normal, and the ophthalmoscope showed no change in the fundus. R. V. with + 3D. = $\frac{20}{30}$; L. V. = $\frac{20}{20}$, H. = 1D. Seven years later, *i.e.*, five years before he consulted Knapp, the right eye was pushed somewhat forward, with a slight deflection down and out. Since then the displacement has gradually increased, and the sight slowly got worse, but there has been no pain or apparent inflammation.

Present condition. The right eye protrudes about 10 mm. farther than the left; its vision with correction is only $\frac{4}{200}$. Mobility of right, full; no pain on pressing the globe, but at the same time no diminution of the exophthalmos. Externally the eye, lids, and conjunctiva seemed normal. No change in position of eye when patient stoops forward. The tendon of the superior oblique can be felt as a cord stretched horizontally from the pulley to its insertion. There is indistinct resistance to deep pressure above the upper part of the globe. Optic disc and surrounding retina opaque, arteries normal, veins enlarged and dark. Examination by means of auscultation was by accident omitted.

The signs suggesting a tumour of the optic nerve, or a growth pressing on, and involving the nerve, the author decided to operate, hoping to remove the growth and at the same time to spare the eye and the nerve also, unless this latter should prove to be the starting point of the neoplasm.

The conjunctiva was incised vertically over the insertion of the internal rectus, and the muscle was detached from the sclerotic and held aside. The next step was to work carefully backwards with curved scissors into the

orbit along the denuded sclerotic until the tumour—which was smooth, round, rather hard and of a bluish colour—could be seen and felt. It appeared to come from directly behind the eyeball towards the upper part of the inner wall of the orbit. By careful dissection and prizing the growth out with a curved chisel the whole mass was removed without injury either to the globe or optic nerve. The internal rectus was stretched forward again in place, and the wound dressed. Hæmorrhage throughout was very slight.

The last note thirteen days after the operation is: "Eye almost in its normal position; binocular fixation; movements perfect. R. V. = $\frac{12}{200}$; with + 6D. = $\frac{20}{200}$. Field normal. L. V. = $\frac{20}{30}$; with + 1D. $\frac{20}{20}$." The tumour was a typical specimen of erectile tissue, and was 37 mm. long, 24 wide and 16 thick. There has been no recurrence.

Judging from his own experience Knapp would have set down encapsuled cavernous angioma in the apex of the orbit as a very rare affection; indeed, this is the only case on which he has operated in the course of thirty-five years' practice. But the cases recorded in the literature of the subject are fairly numerous, and even allowing for error of diagnosis in a certain proportion of them, we are forced to conclude that Knapp has seen less than his average share. With reference to the question of treatment, the author urges the advisability of exploring thoroughly before deciding to remove the eye; this can be done by detaching either the internal or external rectus; but in cases where the presence of a growth is not definitely established Knapp thinks it wiser not to detach a tendon, but to conduct the exploration in the interval between the bellies of the two adjacent muscles. He has proved this to be possible by recently removing an optic nerve tumour without injuring the globe, through the space between the external and inferior recti.

Several cases with symptoms corresponding closely to those above described have come under his observation, but in the absence of pain, and considering the slow growth of the tumours, he did not suggest operation. By

the light of the experience gained from his recent case, however, he has modified his opinion and would now operate without delay, hoping thus to prevent atrophy of the nerve and destruction of the globe by suppuration from exposure.

N. M. ML.

W. VULPIUS (New York). Treatment of Stenosis of the Lacrymal Duct with Permanent Probes. *Archives of Ophthalmol.*, *xxv*. 2.

We refer briefly to this paper because it points out a method of treating obstinate obstruction of the lacrymal duct which deserves, we think, more attention than is generally accorded to it. The author says that while a student he never saw a permanent probe used, except those employed by Schœler for several hours at a time. The experience of the reviewer has been pretty much the same, why, it is difficult to say, for there can be no doubt that in some cases at least a carefully-fitted permanent probe offers a very simple and very efficient mode of relief.

Vulpius was driven to use permanent probes inasmuch as he was practising in South America under conditions which prohibited his seeing his patients except at long intervals. Treatment with Anel's syringe or Bowman's or Weber's probes was therefore out of the question, and he had perforce to fall back on something else. Permanent probes with projecting ends were found unsatisfactory, even though the ends were shortened so as to become less visible at the ocular angle and less exposed to the touch.

Vulpius then tried an instrument with a short horizontal part that lay in the slit lower canaliculus, the vertica part being introduced in the naso-lacrymal canal down to the inferior nasal meatus. The probe was made of the common alloyed silver used by jewellers, which can be smoothly polished and is not easily oxidised, so that the surface remains unaltered and non-irritating for an indefinite time. Its thickness corresponds to a No. 5 Bowman's probe. Both ends are blunt, the horizontal end being a little flattened towards the eyeball. The instrument has to be adapted to the individual case, the chief difficulty lying in the adjustment of the horizontal part. If this turns too much away from the eyeball it will tend to evert the lid and prevent its accurate apposition to the globe. If on the other hand it is turned too much in it will press on the eyeball and prove a fruitful source of irritation. Given a proper position, however, which it only requires a little care to ensure, the probe lies in the lower canaliculus, unseen and unfelt, and may be left there indefinitely. The author instances several cases in his own practice where these probes have proved of great benefit, and have been worn for long periods—in one case four years—without producing any bad effects. He considers that this method of treatment is indicated in all chronic stenoses of the lacrymal passages with their various sequelæ. The probe probably acts by promoting a capillary current between its own surface and the wall of the duct; it is solid metal, not grooved or hollow.

Vulpius advocates the insertion of the permanent probe at the first sitting. No doubt there are cases where this procedure is so obviously indicated that it may be advisable to put it in practice there and then, but as a general rule it is, we think, better to wait for a little before finally falling back on permanent probes. Surely there are many cases of lacrymal obstruction for which prolonged relief, at any rate, is obtained by simple probing on only a few occasions, and while our own experience entirely corroborates that of the author on the value of permanent probes, inserted as he advises, it would, as it seems to

us, be a serious mistake to adopt their use as a matter of ordinary routine. In many cases, however, there can be no doubt as to the value of this method of treatment. We prefer thick lead wire to the silver wire recommended by Vulpius; it is more easily adapted to the slit lower canaliculus, and can be manipulated generally with greater ease. A little sandpaper is all that is necessary to polish its surface, and to round off the ends. We have some cases still under observation, in which such a lead style has been worn, certainly for over a year, without giving rise to the least irritation, and with very appreciable benefit to the patient. When taken out, from time to time, for purposes of observation, the lead has always been found to be smooth and clean. The style causes no deformity; indeed, without the most careful examination it is impossible to say whether it is *in situ* or not.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

E. Nettleship, F.R.C.S., President, in the Chair.

Thursday, May 7, 1896.

Clinical Evening.

Restoration to Normal Vision after Sympathetic Ophthalmitis.—This case was shown by Mr. Critchett. An attempt was made to save an eye which had been injured by a nail; the cornea and lens had been wounded; the attempt failed, and the eye was excised thirty-five days after the accident. Twelve days after the excision of the injured eye the other eye became inflamed, and vision was reduced to inability to count fingers. Under the use of atropine and mercurial inunction the inflammation subsided gradually, and the vision was eventually fully restored.

Extraction of a Dislocated Lens with Good Result.—This case was shown by Mr. Critchett. Two months before her visit to the hospital a middle-aged woman received a blow on the right eye by which the lens was displaced downwards. The left eye had been injured twenty-three years before; at that time there had been also an attack of inflammation in the right eye. The dislocated lens was removed with a vectis; there was no loss of vitreous, and vision was eventually $\frac{5}{60}$. The section was within the cornea. The vectis was preferable to the spoon in some cases, as it sank into the lens and held it more securely.

The President thought the second case of Mr. Critchett's was another instance of recovery from sympathetic ophthalmia. This added to the interest of the operation that had been performed.

Optic Nerve Disease in a Mother and Three Children.—These cases were shown by Dr. R. D. Batten. The mother's sight had failed when she was 12 years old; one of her sisters, aged 33, had the same affection, and also one

brother. In the mother's case the vision was reduced to $\frac{1}{60}$; the optic discs were atrophic, there was slight contraction of the visual field. In the younger generation one boy and two girls were affected; their sight had failed at about 12 years, the same age as the failure in the mother's case. In the boy vision was $\frac{6}{18}$, and there was a central scotoma. In the eldest girl there was pallor of discs, several scotomata, and colour blindness. In the other girl the signs were less marked. There was no other disease in the family.

Case of Spurious Optic Neuritis.—This case was shown by Mr. Holmes Spicer. The patient was a boy, aged $11\frac{1}{2}$ years, whose refraction in each eye was emmetropic, and whose vision was $\frac{6}{8}$. His visual fields were normal; his light and colour sense were normal. Both optic discs presented the appearance of the early subsidence stage of severe optic neuritis; their edges were quite indistinct; they were very pale; their vessels were covered in places with a light veil of haze; there was swelling amounting to about 3 D. The patient had been under continuous observation for three years, and there had not been the slightest change in the appearance of the optic discs.

Mr. Hartridge objected to the term "spurious;" he thought it was a case of persistent optic neuritis, in which the macular fibres had escaped.

Dr. R. D. Batten was reminded of those cases in which a tilting of the optic disc gave rise to an appearance of neuritis on one side only.

Mr. Marcus Gunn asked if a case of this kind had been seen in which recovery had taken place; he had seen it once in an adult.

Mr. Silcock had watched a case of this kind lately in which the patient had been thought to have a cerebral tumour; she had been under observation now for a long time, and the appearances were unchanged.

Mr. Adams Frost did not think the long persistence of the appearances without change excluded optic neuritis.

Mr. Holmes Spicer, in reply, said he regarded the con-

dition in this case as a physiological one, simulating optic neuritis; if it were inflammatory it would be necessary to assume that serious inflammation could last for years without producing any impairment of function in such a delicate structure as the optic nerve.

Lymphangiectasis of the Eyelids.—Dr. D. Mowat showed a case. A small, soft, ill-defined swelling had first appeared in the lower lid; it increased slowly for some months, then spread to the upper lid. The swelling could be displaced from one lid to the other by pressure; if pressure was made on both lids the swelling appeared behind the ear of the same side; there were communicating channels over the zygoma. The swelling had steadily increased so that it was no longer possible to transfer the fluid from one part to another.

One-sided Paralysis of Sixth Nerve associated with Contraction of Orbicularis Palpebrarum and Retraction of the Globe on Inward Rotation.—This case was shown by Mr. MacLehose. It belonged to a definite group of cases, of which he had seen several, all presenting the above signs with some slight variations. Nothing abnormal was detected so long as the patient looked straight forward, but in all the cases there was paralysis of one sixth nerve, or at least inability to move one eye outwards beyond the middle line. When the patient looked away from the paralysed side, the lateral deviation of the two eyes was usually full and equal, but associated with this inward rotation of the affected eye was a marked contraction of the orbicularis palpebrarum of the same side, causing wrinkling of the skin all round the lids and a pronounced narrowing of the palpebral fissure. The eye at the same time receded into the orbit to such an extent as to leave a clear interval between the anterior surface of the globe and the posterior surface of the lower lid. Mr. MacLehose could offer no satisfactory explanation of the retraction. He had had a case recently where the same phenomena were present, but there was in addition a moderate degree of permanent enophthalmos of the affected eye. Probably

the permanent and temporary enophthalmos had no connection with each other, but their association was interesting. Although he called it paralysis of the sixth nerve, he thought the condition was congenital, and might perhaps depend on variations in nerve supply or muscular development.

Mr. Holmes Spicer had recently had a case which might throw some light on this condition. The patient was a boy who had vertical diplopia ; the right eye was on a higher level than the left; when he looked to the left, the right eye went completely upwards. The diplopia was so troublesome that Mr. Spicer divided the superior rectus. It was not easy to find it, but after free exposure it was seen to be inserted far to the outer side towards the external rectus. If the same abnormal attachment were also present in the inferior rectus, the effect of both muscles acting together when looking to the left would be to pull the eye backwards.

Transplantation of Skin to the Surface of the Eyeball for the Cure of Symblepharon.—This case was shown by Dr. Bell Taylor. A male, aged 40, had symblepharon following a burn by hot slag. The lower lid was firmly adherent to the globe, covering the lower third of the cornea. Repeated attempts to secure separation of the adherent tissues by the usual methods failed. Eventually the lid was dissected off the eyeball, and a piece of skin from the upper eyelid of the uninjured eye was transplanted on the surface of the globe, to which it readily became united.

Posterior Lental Opacity, Remains of Hyaloid Artery and Coloboma Lentis.—This case was shown by Mr. Cartwright. The coloboma of the lens was upwards and outwards; the suspensory ligament was attached to the remains of the fibrovascular sheath.

Detachment of the Retina treated by Drainage.—This case was shown by Mr. Eve. A young man showed evidence of choroiditis and vitreous opacities before Christmas; in February the retina became suddenly detached. Treat-

ment by iodide of potassium, pilocarpine and the recumbent position had no effect. An incision into the sclera was made, a trochar and cannula were inserted, the fluid withdrawn, and a horsehair drain placed in the eye. Seven weeks afterwards no detachment could be made out, and the visual field was normal.

Case of Proptosis, Optic Atrophy and Ophthalmoplegia.—This case was shown by Mr. Marcus Gunn. A woman, age 67, suddenly had proptosis of the right eye. The third, fourth and sixth nerves were paralysed, the optic nerve was atrophied, the pupil was dilated and inactive, the conjunctiva œdematous. He thought the case was probably one of hæmorrhage from an aneurysm of the ophthalmic artery.

Mr. Eve had had a case with a similar history, which proved to be a pulsating sarcoma at the back of the orbit.

UHTHOFF AND AXENFELD (Marburg). Contribution to the Pathological Anatomy and Bacteriology of Suppurative Keratitis in Man. *Von Graefe's Archives, xlii.-i., p.* 1.

This article is the record of an elaborate investigation concerning the dependence of different forms of suppurative keratitis on different micro-organisms.

Part I.—Pathological Anatomy. The material examined was obtained partly by exenteration, partly by enucleation of the eye. It comprised five cases of true serpiginous ulcer of the cornea in an advanced stage; four of kerato-malacia or necrotic ulceration of the exposed portion of the cornea; two of commencing panophthalmitis after severe septic ulceration; and one of kerato-mycosis aspergillina. Serpiginous ulcer of the cornea is here defined as that form in which the ulcerative process spreads over the surface of the cornea, presenting a crescentic, undermined, suppurating margin in one direction, whilst the part first affected quickly throws off the destroyed tissue, clears, and becomes covered with epithelium; spontaneous perforation occurs only after wide extension of the superficial ulceration. To be distinguished from this are the various forms of deep suppurative infiltration which lead to crater-like, or trough-like destruction and early perforation. To this group belongs the rapid necrotic destruction of the exposed portion of the cornea in marasmus, known as kerato-malacia. Neuro-paralytic keratitis also belongs to the non-serpiginous group. The rare chronic form of keratitis which begins near the margin and advances in the shape of a horse-shoe, which is followed by cicatricial opacities, does not suppurate, and never leads to perforation, is here termed rodent ulcer of the cornea. With this form the present article has no concern.

Having described their cases in detail, the authors proceed to summarise the results. The anatomical examination revealed changes agreeing well with the clinical types of the disease, in the serpiginous group, a widespread superficial ulceration advancing at the one side, healing at the other; in the cases of kerato-malacia, a deep ulceration with perforation, or tendency to it, and with extensive necrosis of the invaded tissue, situated chiefly in the lower half of the cornea, and affecting the iris chiefly in the corresponding region. The two cases of commencing panophthalmitis were characterised by spreading of the micro-organisms and inflammatory changes into the deeper parts of the eye.

Descemet's membrane was found to be perforated only when the cornea was perforated through its entire thickness. In one case, where there appeared at first to be perforation of this membrane without complete perforation of the cornea, further examination proved the appearances to be deceptive. In no case was there any evidence that leucocytes or micro-organisms had perforated the membrane otherwise than by a rupture in its continuity. The endothelium of the cornea presented well-marked changes, especially in the region of the ulcer, even though Descemet's membrane remained entire. The corneal parenchyma exhibited œdema, enlargement of the lymph-spaces, proliferation of the cells, and sometimes fibrinous exudations between the layers.

The infiltration of the cornea with leucocytes occurred in all cases from the margin towards the ulcer, and chiefly in the superficial layers, and was associated with infiltration of the adjacent conjunctiva and episcleral tissue. The middle layers of the cornea were comparatively free, while those adjacent to Descemet's membrane were usually much infiltrated. In cases of severe central ulcer the infiltration came from the entire circumference of the cornea; in keratomalacia with necrotic ulcer in the lower third the infiltration proceeded chiefly from the lower margin of the cornea. By reason probably of the advanced stage of the process in most cases, the infiltra-

ting leucocytes were not found to have been arrested in a ring around the ulcer, as in Leber's inoculation experiments, but passed completely into the necrotic area. Bowman's membrane exhibited no special resisting power comparable with that of Descemet's membrane. The corneal epithelium, often widely destroyed around the ulcer, showed, nevertheless, a remarkable proliferation in the neighbourhood of the ulcerative process.

The source of the hypopyon was evidently the iris and the neighbourhood of Fontana's spaces and Schlemm's canal. In cases of serpiginous ulcer, the inflammatory changes in the iris, especially its periphery, were strongly marked, and extended to the whole of the anterior portion of the uveal tract. In keratomalacia they were much less pronounced, and were nearly confined to the lower part of the iris. In one case of severe septic ulceration of the cornea without hypopyon, the absence of the latter proved to be due to absence of the iris with complete atrophy of the anterior portion of the uveal tract. The tendency to hypopyon was smaller when the ulceration affected the periphery of the cornea than when it was central. The direction in which the ulcer spread was usually towards the most distant part of the corneal margin.

The two cases of panophthalmitis after old septic ulcer showed a rapid extension of the inflammatory process to the deeper parts, and especially to the retina, in or on which fibrinous exudations occurred.

Part II.—Bacteriology. Having briefly reviewed the literature of the subject, the authors proceed to describe their own observations. The cases examined were fifty in number, and comprised typical serpiginous ulcer, thirty-five cases; hypopyon-keratitis, not with serpiginous ulcer, ten cases; keratomalacia or necrosis in the exposed portion of the cornea, two cases; keratomycosis aspergillina, one case; commencing panophthalmitis after corneal ulceration, two cases.

The method of examination was as follows:—The ulcerated surface having been subjected to a strong stream of sterilized water, with the object of removing the adherent

secretion and any micro-organisms which had secondarily affected it, some of the diseased corneal tissue was removed with a sharp point, partly for staining and microscopic examination, partly for inoculation. The inoculations were corneal, and in some cases also subcutaneous and intra-peritoneal; the animals employed were rabbits, guinea-pigs, and white mice; the experiments were varied so as to test the durability and the intensity of the virulence of cultures of different ages. The keratitis produced was then examined bacteriologically.

The pneumococcus was found in twenty-six cases, of which twenty-four were typical serpiginous ulcer, the other two commencing panophthalmitis; pneumococcus, with other micro-organisms, in seven cases, of which five were typical serpiginous ulcer; other micro-organisms, but no pneumococcus, in thirteen cases, of which four were typical serpiginous ulcer; no micro-organisms discovered, in four cases, of which two were serpiginous ulcer. The general result, therefore, was an intimate association between serpiginous ulcer and the pneumococcus—more intimate indeed than would appear from the figures, for in several of the cases in which other micro-organisms were present these latter were proved, by inoculation experiment, to be non-effective. Moreover, it is probable, the authors say, that the apparent absence of the pneumococcus in certain cases was attributable to a faulty method of culture. In three cases of severe keratomalacia, streptococci appeared to be the infective agent. The pneumococcus appears, therefore, to be specially associated with the serpiginous form of ulceration of the cornea.

On the healthy conjunctiva, examined in thirty cases, the authors found the pneumococcus to be rare; on the conjunctiva of eyes suffering from serpiginous ulcer it was much more frequent.

The micro-organisms multiply chiefly in the suppurating area of the cornea, but not only here; they were found also in the deeper and peripheral parts of the cornea, and, in two cases of commencing panophthalmitis, in the vitreous and on the retina. In many cases they were

found enclosed in cells, but neither the micro-organisms nor the cells appeared to be destroyed thereby. The authors, therefore, following Leber, attach no great importance to phagocytosis in the arrest of the process.

The pneumococcus is known to be destroyed by its own products when these reach a certain degree of concentration, and this characteristic may, perhaps, explain the peculiar character of the serpiginous corneal ulcer, namely, the arrest and repair of the ulcer at one part, the extension at another, and the absence of deep penetration. Other micro-organisms, *e.g.*, staphylococci and streptococci, preserve their vitality longer, in spite of concentration, and may, therefore, be assumed to have the power of destroying the tissue more deeply. The well-known comparative mildness of the panophthalmitis which occurs in epidemic cerebro-spinal meningitis, and which depends on the pneumococcus, may also be reasonably attributed to the death of the micro-organism within the eye by auto-intoxication.

Experimenting as to the source of the pneumococcus, the authors failed to find it in the objects by which corneal abrasions are commonly produced, *e.g.*, ears of corn, fragments of wood, stone, &c. On the contrary, they found it frequently in secretion from the tear-sac, and are disposed to attribute the infection in many cases to this source.

As regards the character of the corneal ulceration associated with various other micro-organisms, some details of which are here given, it is too soon to speak with precision, but the authors hope that further observations will gradually establish the connection of each with a particular micro-organism.

P. S.

NOTES ON VISION AND RETINAL PERCEPTION.

Being the Bowman Lecture of the Ophthalmological Society, delivered on Friday, June 12, 1896.

By H. Snellen, M.D.

PROFESSOR OF OPHTHALMOLOGY AT THE UNIVERSITY OF UTRECHT.

Mr. President and Gentlemen,—It was with no small degree of appreciation that I received the flattering communication from the secretary of the Ophthalmological Society, that the Council had conferred on me the privilege of delivering, this year, the Bowman Lecture. I count it no small honour to be allowed to contribute in any way to the honour, and to the memory, of Sir William Bowman. It filled my mind with justifiable pride, and revived in me the grateful remembrance of his personal acquaintance, and of the kindness and friendship with which Sir William Bowman always favoured me.

Thanks to Donders' introduction, well nigh forty years ago, I had the privilege of being his guest at his pleasant and hospitable home in Hampstead; and many a time since have I had ample opportunity of admiring his unparalleled skilfulness as a brilliant operator, a scientific physician, and courteous lecturer. My acquaintance with Bowman will always be a source of gratitude to me; and many a word of his remains in my memory and makes me cherish and revere the vivid recollection of his inspiring personality.

Amongst the many kindnesses for which I am indebted to Bowman, I highly value his introducing me to a circle of illustrious men, from which many bonds of friendship with this hospitable country have resulted.

The opportunity of refreshing kindly remembrances, and the chance of meeting again with friends of long ago, could not be anything but most agreeable to me, and, in following the impulse of my wishes, I accepted your invitation without a moment's hesitation. But now that I am about to prepare myself for the task you have entrusted

to me, an earnest doubt arises: Shall I be able, successfully, to cope with the difficulties with which I am hampered, as far as the language is concerned? It is true that nobody can be better aware than I of the great indulgence which in England is extended to the foreigner in this respect. It goes for much, but it does not release the lecturer from what he requires from himself.

As to the choice of a subject, we mostly do best by restricting ourselves to what we have been lately occupied with.

It is in so doing that I will beg your attention to a few observations, regarding vision and retinal perception:

Of all practical questions on clinical work, diagnostic enquiry has, more than anything else, extended its dominion.

Recent ophthalmology points with lawful pride to many a new appliance, and also to a remarkable extension of its field of investigation.

Not only does our diagnostic art involve the diagnosis of the disease, but the oculist is more and more called in to examine the vision of eyes considered normal. A quantitative determination of the highest degree of visual acuity is required, and we have to consider what limit of vision is to be fixed for each department of the daily increasing host of railway and naval officials. The increased rapidity of transport and of travelling demands a continually growing use of signals, which claim, as well as technical capacity, a careful enquiry into the efficiency of each responsible man. Donders was the first to point out the international interest of these questions, and to cause this part of the ophthalmologist's duties to be acknowledged.

It is chiefly in England that these views have met with serious consideration.

With regard to visual enquiries, most earnest investigations have been made by this Society and by the British Medical Association, for the latter of which I have but to allude to the invaluable Report of April, 1892, which has laid the basis for all further international negotiations on this important question.

Several colleagues, greatly interested in the subject, initiated a conference in September last, at Amsterdam. The reports, just published, furnish unmistakable proof of the concurrence of English authorities in this matter.

During this conference many scientific questions were advanced, rousing new interest and exciting new researches.

We also have been stimulated to work in the same direction. I beg to be permitted to lay before you some views and investigations in several questions on vision still open to discussion.

I.

The idea of expressing the acuity of vision, as inversely proportional to the smallest visual angle has been very generally adopted ; but it is far from being the case, that one and the same sort of objects are used for these determinations. Alterations—not always improvements—have again and again been recommended from all sides.

But it is clear, that, where objects are used which do not agree with the standard—being either too easy or too difficult—the expression $V. = {}^{d}/_{D}$ loses all its value, unless there be added a co-efficient, expressing the proportion between the distinctness of those objects and of the standard lines, such as the three parallel lines with interlines of equal width which we have adopted.

Shortly after the test-types had been introduced, a controversy was begun by Prof. K. Vierordt, who doubted whether it was right to apply the visual angle, *i.e.*, the linear measure of the retinal image, for expressing acuity of vision, and whether it would not be preferable to take into account the surface of the image, *i.e.*, the square of the diameter.

This suggestion of Vierordt has lately been repeatedly referred to and deserves therefore to be taken into consideration.

We measure the acuity of vision as being in inverse proportion to the visual angle, after the example of Hooke (1705), and, for practical purposes, this is satisfactory, even if perhaps it may have to be considered of a conventional value.

This determination of vision answers fully to the wants, which were stipulated for by Bowman, for his tonometric measurement, demanding, like all clinical investigations in the very first place, rapidity and simplicity.

Meanwhile we can yield to Vierordt's views in so far as to admit that the recognition of form depends on other and on more complicated considerations than can be afforded by the simple linear measure alone.

If we analyse our types, as they are constructed, within the twenty-five-fold square schemes, we see that they can be regarded as a combination, in different order of sequence, of twenty-five small blocks, white and black; the **F T L**, for instance, each filling up twelve to thirteen of the twenty-five blocks, of which—as must be acknowledged—each represents a square surface.

On the other hand it may be observed, that the value of perception is not fully represented by the size of the square measure of the retinal image, because the perceptivity of the fovea is not equal all over; but diminishes from the centre to the periphery; thus a four times larger image does not correspond to a four times greater distinctness of the impression.

And, besides, the act of vision is not altogether confined to the perception of a stationary retinal image. On the contrary, in accurate and quiet observation of any object, by imperceptible movements of the eye, we cause the different parts of the image to move successively over the centre of the fovea; and each muscular action unquestionably represents a linear measure. We, therefore, look upon the act of vision as a compound function, partly to be measured by linear, partly by square measure. But if we were to grant to Vierordt: "that truth is more nearly approached by expressing the psychological value of the retinal image by square measure," even then there would remain good reason for continuing to determine vision by linear measure, and to register it as such, bearing in mind in the meantime that we can always find the square value, whenever we want it.

Possibly square measure will prove to be preferable in

the research into the relation of the degree of illumination to visual acuity. Evidently, we want square measure, for the comparison of the differentiation of oblong and of square figures.

Let us consider, for instance, these letters. E, measuring four by nine. The square measure is thirty-six, of which the root is six ; its superficial measure therefore will be equal to a similar figure of six by six. Experience now proves that there does not exist any real difference in the distance, at which both can be recognised. Both are beheld with equal clearness, when seen at the greatest distance, at which the square one can be seen. This, of course, is confined to certain limits. If the lines become very thin accessory circumstances, such as irradiation or contrast, will arise. A further examination of oblong and of square figures, of equal amount of surface, leads us to another consideration. If, instead of taking white and black letters, we take coloured ones, we find that colour and shape both act in the same manner. In both cases we find a complete similarity between the oblong and square letters, if they are of the same superficies.

If this be so, and it is easily proved, if, thus, colour and shape are subject to the same rules as to linear and to square measure, the question arises, why should we restrict all the advantages of the linear measure to the determination of vision, and why should we not do the same for the determination of colour-perception ?

According to the method of Donders, the quantitative value of colour-perception is determined by comparing the distance, at which a person distinguishes coloured discs, with the distance at which we ourselves, or any other person of a well defined colour sense, can do so.

This method, although it has been found to answer admirably, has never attained much popularity, nor any general adoption. It is an open question whether this is not to be attributed to the general opinion, that the recognition of a coloured surface must be registered by square measure, which hampers the rapidity and simplicity of the method. Why should we not, just as with the

determination of vision, here also avoid all complication and content ourselves with registering the figures as we find them, *i.e.*, by linear measure, provided we remember that this conventional value does not represent **C** equal to the colour-sense in the general acceptation, but to root of **C** from which we can find **C** whenever it may be wanted? Donders agreed with this opinion, and in the regulations of railway servants' examination he expressed the amount of colour-sense by the angular, *i.e.*, linear measure.

II.

Another point, to which attention was drawn at the Amsterdam Conference in connection with the determination of the acuity of vision was its dependency on the amount of illumination. It is well known that vision diminishes with decrease of illumination, but the mutual relation of the two has not as yet been well determined. We have to thank Dr. Thomas H. Bickerton, of Liverpool, for recalling this subject to the attention of the meeting.

"A point, which has not yet been mentioned (page 247, *Comptes Rendus*[1]), but one of vital importance to the establishment of standard test-types for the acuity of vision, is that of illumination." . . . "Thus, in coming to an agreement, as to the standard test-types, let us do the same as to the necessary illumination."

The further discussion on this subject proved that the meeting agreed with Dr. Bickerton, but at the same time the difficulties of stating the degree of illumination, especially of daylight, were pointed out.

Different investigations into this question have been published, but we meet with many contradictions as to the results. It seemed desirable to make a new series of observations, with the special view of studying the sources of errors, which may have given rise to the contradictory conclusions.

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[1] *Comptes rendus de la conference internationale concernant la service sanitaire des chemins de fer et de la navigation*, Amsterdam, 20 et 21 Sept., 1895, p. 247.

Two of our scholars at Utrecht have endeavoured to act up to this suggestion. Dr. Laan and Dr. Piekema, both with young and healthy eyes, set to work to determine their acuity of vision under different degrees of illumination.

We resolved to carry out the experiment by artificial light and tried to provide a gas-lamp of well-determined intensity.

It immediately became evident, that, as a rule, a common gas flame burns very unequally on account of the difference of quality of the gas and of the constant change of pressure to which gas is liable.

Preliminary experiments made in our Ophthalmic Hospital proved to be useless. We surmounted these difficulties by the kind assistance of the manager of the gas works at Utrecht, Mr. V. D. Horst, to whom we feel greatly obliged.

By passing the gas over benzine the quality was made constant, and a special regulator provided the required constancy of pressure. We made use of an Auer's incandescent burner, which was daily photometrically controlled.

The lamp was placed on a small vehicle, which could easily be moved, over rails up to a distance of 1 to 20 metres, so that we had at our disposal a degree of illumination ranging from 1 to $\frac{1}{400}$.

The distances from the object to the lamp and to the observer could be accurately measured by a scale placed along the rails.

All light from the outside was carefully excluded.

The lamp was placed within a black box, and, of course, care was taken that it remained in the same enclosure, while the intensity of the flame was photometrically determined, because the interior of the box—though painted dead black—still caused a perceptible reflexion.

In this series of determinations, the intensity of illumination was measured by the intensity of the source of light, which requires an absolute absence of all other light. The consequence is, that the eye remains adapted to darkness,

and also, that the types are seen against a darkened background.

It is clear that these determinations were made under unusual circumstances. We found here confirmed, what daily experience teaches, that the amount of vision must, under such circumstances, be greater than when the eye is adapted to stronger light.

In order to obtain a more complete knowledge of the effect of light on vision, it was desirable also to make a parallel series of determinations, in which, in every instance, the illumination of the surroundings should correspond with the illumination of the objects under examination.

Till lately it has been impossible to determine directly the amount of light on a surface without examining the source of illumination.

Now, however, the photometer of Leonhard Weber enables us to do so. This instrument is of great value for our purpose, and allows us to measure the light on each surface.

In 1883, this photometer was devised by Prof. Leonhard Weber, and has since been considerably improved. The chief features of this instrument consist in two communicating tubes, placed at right angles to each other. At the place where they meet, a mirror is adjusted at an angle of 45°, in such a way that, by looking through the eye-piece, we can observe the interior of both tubes in one case through the mirror, in the other by the side of the mirror.

At the end of tube A, opposite the mirror, is a benzine candle, which, by an ingenious contrivance, can be made to burn with a very constant light. This illuminates a white opal plate, which can be moved to and fro through the tube, along a millimetric scale. The illumination of the plate, accordingly, will be in inverse proportion to the square of the distance from the light to the plate.

If bright daylight is to be tested, we place at the end of tube B, one out of several white opal plates, which have each a definite power of absorption, the special one being chosen according to the intensity of light that is to be determined.

The intensity of the light that is given off from the surface, which we want to determine, is now measured by the quotient of the square distance (R^2), from that surface to the plate, and the square distance, from the flame to the movable plate (r^2), multiplied by a coëfficient C, which is defined for every plate according to its power of absorption ($T = \frac{R^2}{r^2} \times C$.)

With this photometer, it is possible to measure very different degrees of illumination. As the instrument is now constructed, however, it does not allow us to determine a light lower than 1 mc., namely, one standard candle at one metre distance. If we have to determine the acuity of vision by a feebler light, grey glasses, of which the power of absorption has been ascertained beforehand, can be used before the eye.

This photometer, although a most valuable instrument, cannot as yet be said to be perfect in *every* respect. Great difficulty arises from the difference of colour of the benzine flame and of daylight, and it is exceedingly difficult to judge of the equality of two illuminated surfaces if they are of different colour. Weber endeavoured to meet this objection by providing the eye-piece of the tube with a green or a red glass alternately. The difference in colour then disappears, and, from the combination of the two observations, the intensity of the light can be, approximately, calculated. It would be best if the benzine flame could be replaced by a source of white light of a constant intensity.

We have endeavoured to meet this difficulty by designing another plan for avoiding the difference of colour, namely, by taking test-types on tinted paper, of about the same colour as the benzine flame. By this arrangement the light on both plates of the photometer becomes of the same colour, and all difficulty of comparing the illumination of the two plates is overcome, without interfering with our purpose of making a comparative determination of visual acuteness.

It was surprising to find, after several examinations of the daylight, how very changeable its intensity was. A

white cloud or a ray of sunshine breaking through the clouds renders the light ten times more intense.

Prof. Cohn, of Breslau, has subjected this matter to extensive experiments. He stated that in the course of a few minutes it had been equal to 89, 106, 58, 19, 76 metre-candles. He found that a clear sky is less intensely illuminating than a sky overcast with grey clouds. With rain clouds the intensity of the light equalled from 49 to 54 mc. The unprotected eye hardly perceives considerable changes when the illumination is intense. This proves that the efficiency of the increase of light on vision shows itself less if the light exceeds a certain amount. We shall see that the maximum of vision is reached at a degree of illumination beyond 50 mc. On the contrary, with decrease of light the vision soon diminishes, and every change is then clearly perceived.

It is well worth while to trace the effect of decrease of illumination on vision. Many researches have been instituted on this question, with the most various results; and we are as yet far from being able to establish a law concerning the relation between the degree of illumination and the acuity of vision. "We must even," Uhthoff asserts, "positively reject all the formulated laws, that have been proposed by different authors, where changes of illumination of any important degree are concerned." Indeed, the results of the different observers are most diverse; but undoubtedly these experiments are very liable to error.

Errors may occur with both the methods of research, which we have indicated, viz., either by determining the vision with the illumination from one source of light, or by applying a general illumination, the intensity of which it is necessary to state.

As a rule, previous experimenters did not keep the two methods strictly separate; moreover, the last-mentioned method could not be well applied before we possessed a photometric instrument which enabled us to measure directly the illumination of a surface while exposed to light.

To give a summary of all former experiments, and to compare the results, would lead us here too far. For this we refer to an essay of Prof. Hermann Cohn (*Archiv. f. Augenh.*, 31, p. 197), containing an account of the principal former researches. I will confine myself here to pointing out what means have been attempted by different observers.

Tobias Mayer (1754) was the first who seriously set about attempting this examination. He determined the visual angle with parallel lines, and illuminated them by means of a candle placed at different distances.

He deduced from his results that the visual acuity depends on the illumination in proportion to the sixth root of intensities. Later researches, however, have not confirmed this conclusion.

A century later (1865) these experiments were renewed by Aubert, to whom, in every direction, physiological optics are greatly indebted.

In a perfectly closed room, daylight was let in through an aperture, which could be widened or narrowed at will. As objects he used Jaeger's reading-tests, at 1 metre's distance from the aperture. We have already seen what a changeable source of light daylight is.

In 1876 a prize was instituted by the Insbruch faculty for a mathematical law, showing the relation between vision and intensity of illumination. In answer to this question a set of most accurate experiments was made by A. Posch. As test objects he used parallel lines, with interspaces of the same breadth ; his source of light was a lantern of Dubosq, with achromatic glasses. He came to the conclusion that, within certain limits, the acuity of vision increases as the logarithms of the light intensities, *i.e.*, that acuity of vision increases arithmetically, while the intensity increases in a geometrical progression.

With the same view, experiments were made by Carp, a scholar of Prof. Schmidt-Rimpler's, of Marburg, who tested the vision by daylight, and moderated this by dark glasses, of which the absorptive power had been accurately determined. No account was taken of the variability of daylight.

Cohn made a series of experiments also by daylight, and used absorbing glasses, and intends to determine the degree of light with Weber's photometer. These results, however, have not yet been published.

An elaborate account of former researches led him to the conclusion that there exists a great variation with different observers, and he concludes that we are still very far from being able to establish a law concerning the relation between vision and intensity.

It may be remarked, however, that this variation may partly depend on Cohn's method of comparison.

Cohn takes as his basis of comparison the amount of light which proved to be necessary to obtain vision $= \frac{6}{6}$. But $\frac{6}{6}$ represents full vision only for a certain number of persons; for others it represents less than full vision. In order to form a comparison between different individuals it is necessary to take as a basis the maximum of each individual visual acuity.

A normal eye, after required adaptation, reaches its maximum of visual acuity at an illumination of 30 to 50 mc. Beyond this, the vision hardly increases with the increase of intensity.

Klein only mentions that he obtained a further increase of vision when the intensity of light was carried much higher. Probably this is to be explained by a more extensive narrowing of the pupil, which will improve the sharpness of the retinal image, if there be abundance of light, especially if refractive errors be present, as these will be corrected by the stenopacic effect of a myotic pupil.

Our own experience shows that the effect of the change of light is restricted to the lower degrees of illumination.

I will not trouble you with numbers or figures, but I ask your permission to show you a representation of the facts, by means of some curves, which give the results of determinations of vision, either with one single source of light in darkness, or where, in daylight, the illumination of a surface can be photometrically measured. Our own observations are also not entirely free from errors; both in the dark and by light they are liable to two principal

sources of error, which we could not altogether avoid. These spring first from the necessity of keeping the illumination constant, and secondly, from the adaptation of the eye. With both methods these two considerations are the sources of great difficulties. We did succeed in obtaining a light of constant intensity when experimenting in the dark; but the influence of reflected light could not be entirely avoided. We had at our disposal a large building, which had been used as a warehouse for coals. The wide distance from walls and ceiling, which, moreover, were darkened with coal-dust, enabled us to disregard all reflection from this quarter. The floor, however, offered a disturbing reflex from the upper part of the lantern, which varied with the distance between the object to be observed and the source of light. Besides, it proved impossible entirely to avoid difference of adaptation. This changes at the time during which the illumined object is observed. We endeavoured, between each two successive observations, to give the eyes rest by fixing them on the darkest part of the room.

Disturbing influences, owing to incorrect adaptation, make themselves much more felt when we experiment by daylight. It would be very difficult, and would require no end of precautions, to ensure the light being equally spread over the room with every change in its intensity. Under these circumstances the adaptation must be different after having looked either at an illumined window or at a dark corner of the room. On repeating these experiments, we should recommend the observer to place before the eyes spectacles with frosted glass, between the successive observations.

(The lecturer here demonstrated a series of curves, which we are unable to reproduce, showing diagrammatically the results of the observations made by his two assistants, Drs. Piekema and Laan. They are shortly as follows.)

All the curves from observations by daylight show more irregularities in form than those taken in a darkened room. This must be accounted for by want of correct adaptation.

The curve of average value which represents vision after

adaptation for the dark surpasses that representing vision in daylight.

The curve of binocular vision is everywhere higher than that of monocular ; but the difference is nowhere so great as is stated by Nicati and Masé de Lépinar, who hold that the addition of the second eye is equal to doubling the intensity of light.

It is to be expected that diaphragms would, with a feeble degree of illumination, decrease the acuity of vision, perhaps also by diffraction at the margins of the opening. On the other hand, a diaphragm with narrow aperture may have a favourable effect, inasmuch as it lessens irregularities of refraction. From our curves it appears that an artificial pupil of this kind does not produce a considerable change.

The position of Posch, that the visual acuity should increase in arithmetical progression just as the intensity increases geometrically, we do not find confirmed.

From the different observations on the influence of illumination on intensity of light, some conclusions may be drawn of a practical nature. Beyond the intensity of 50 mc. the visual acuity no longer increases with increase of intensity. This explains why we notice almost nothing of the rapid and great changes of bright daylight. This fact is of further practical application.

Objections have been raised that in the determination of visual acuity, and in the rules laid down on this head, no sufficient notice has been taken of the intensity of the light, and that the required degree of this intensity is not indicated. We see now that this remark is correct, as far as feeble illumination is concerned, but does not hold good of strong illumination. The maximum of visual acuity is reached with 50 mc., and if the eye has been adapted to the darkness for a considerable time, with 30 mc.

So the only care that has to be taken in the determination of the acuity of vision is that the degree of illumination does not fall below 30 to 50. This degree of illumination is easily reached, and, to make sure, we can ascertain with Weber's photometer whether the intensity of the light is great enough.

Another subject on which these observations may throw light is the question, "what intensity of light is required for trades in which good visual acuity is essential?"

We were led to start these observations by a question to this effect, directed to us by our Government. In obedience to art. 6 of the law of June 20, 1895, on factories, regulations were wanted for the required illumination of factories and workshops, and the question was submitted to us: "Is it possible to determine the amount of light necessary to the workman with normal eyes for a certain sort of work?" and further, "if such an amount of light is to be determined, is there a practical method to measure that amount of light?"

To answer these questions we set to work in a practical way, and repaired with the photometer to workshops, in order to determine the intensity of daylight at different times, and further, when twilight began to fall, to ascertain where, at the waning of daylight, the want of light begins to impede the man's work. In a printing business we found this to be the case for compositors when the illumination sinks below 15 mc. With an intensity of 15 mc. a visual acuity of $\frac{6}{6}$ is the extreme limit. As a rule all work is arranged so that it can be done with this vision. But for the man to have his whole visual acuity at his disposal it is necessary that a much greater intensity of light should be obtainable. If, however, the intensity of light at dusk does not fall below 15 mc., we shall be sure to have in the daytime an intensity of between 30 and 50 mc.

In answer to the questions which were laid before us, we come to the following conclusions: "that in every workshop a minimum amount of 15 mc. is necessary for work resembling reading, whereas a 'minimum' of 10 mc. will do for coarser work, *e.g.*, that of carpenters and blacksmiths; that in broad daylight the required amount is between 30 and 50 mc., and that it must be possible to exclude direct sunlight. The determination of the intensity can be done best by means of a Weber's photometer."

In another respect the study of the influence of illumination in the visual-acuity has caused us to make special arrangements in the operation-room at our new hospital.

Undoubtedly the highest demands on the power of vision may be made where delicate eye operations are to be performed. Considering that the visual power is heightened by adaptation for a weaker light than that by which the object is usually observed, we have arranged our operation-room as a roomy and lofty apartment, of which the walls, the ceiling, and the floor are painted black, bordered, for ornament, by a very dark grey. The light falls in through a great window, facing the north, which can be reduced insize by separate black blinds.

This arrangement answers entirely to our expectations. The operator has at his disposal the maximum amount of his vision, provided he be careful not to look from the dark apartment to the light outside; and, beyond this, our arrangement proves to have the additional advantage that the images reflected on the cornea can be entirely avoided when the light enters from one direction only. Also the patient keeps his eye open more easily, and, further, there is this great advantage, that the patient can distinguish more clearly the flame of a candle when seen against a black wall; and, according to Priestley-Smith, there is no better means of making the patient's eye keep the right direction than by directing it towards a flame.

Experience has taught us that Priestley-Smith's hint is a most valuable one, provided that the illumination be arranged so as to allow the patient easily to distinguish the flame.

III.

The adaptation of the eye to light is a highly-important phenomenon. Like the size of the pupil, the sensibility of the retina changes under the influence of light and dark. Hitherto it is chiefly the duration of these phenomena that has been examined, and the results show us that the time required for adaptation corresponds to the period of anatomical changes in the retina, viz., the formation and

disappearance of visual purple, the alteration in shape and size, as the results of the influence of light and dark, of the pigment cells and cones, which have been known only during the last few years.

Our knowledge of them gives us a better insight into these important, and, hitherto, mysterious phenomena. Moreover, Hering's theory on retinal perception assists us in arranging the facts and searching for an explanation.

In the study of the observation of light and of colour the enquiry into the after-images occupies an important part; these phenomena are closely related to those of the adaptation of the eye, and to the influence of different parts of the retina on each other.

You will allow me to call your attention to a special review of some of these important phenomena. Aubert was the first to insist that the after-images can be best studied successfully when reduced to their simplest form. For this purpose he made use of the electric spark, with which he illumined a small coloured surface. The results were highly remarkable, differing, as they did in many respects, from former observations. In 1891 they were once more examined by Prof. W. Hess, and in 1894 by Dr. H. P. Bosscha, of Utrecht. At present their study is occupying us again, and we will endeavour to analyse them more minutely. These experiments are highly instructive where we are engaged in accounting for perception of colour; indeed, they are so remarkable that it is a matter of surprise that they have not been examined and studied oftener. In their results they furnish us with matter by which to test the theories on the perception of light and colour. I beg to be allowed to describe these experiments and to recommend them to your attention. I know of no observations that are so beautiful, and, at the same time, stimulate the student so powerfully to further enquiry.

Like Aubert, we started from the principle that these observations ought to be reduced to their simplest form. As far as possible, we shall try to keep to this principle, even more rigidly than was done in former observations.

The object observed is a small plate, standing detached from other things. We have at our disposal a large apartment, of which the walls are quite dark, so that the observed plate stands at no less than 8 metres' distance in front of its dark background. The plate is properly illumined by an electric spark of great intensity, the light of which is reflected on the plate by a concave mirror.

Between the spot where the spark arises and the observer, a screen has been placed, preventing the spark from being directly seen. We prefer the electric spark to the illumination of the closed lantern with momentary opening, because, in case of the spark, the duration of the illumination may be neglected, and it is very difficult, in using the lantern, to avoid all escape of light. And it is necessary that the experiments should be made in absolute darkness: the trustworthiness of the observation is entirely dependent on the eye being kept in absolute darkness. The slightest glance at a light harms the accuracy of observation. Where these precautions are taken, we see a constant series of phenomena, succeeding each other rapidly. It is therefore advisable, with every observation, to restrict our attention to one of the phases, so that, with the first experiment, the beginning, and with the second, the end of the phenomenon is more particularly observed.

The phenomena then showing themselves are as follows: The moment the spark flashes forth there appears on the plate a bright flood of light, which rapidly increases in intensity and fades away in a nearly corresponding period of time.[1] During the increase in intensity the flood of light has the same colour as the plate; during the decrease we see the opposite colour. We estimate the duration of the whole phenomenon at less than a second; under certain circumstances, however, it is longer. Whereas Aubert had noticed this change of colour of the after-image, only with red light, Hess proved conclusively that it is to be observed with all colours. We found it to be so for all colours, provided they are sufficiently saturated.

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[1] Aubert, *Phys. Optik.*, G. 502.

Also mixed colours, such as yellow-green or violet are seen as such, and likewise give the opposite mixed colours. A white screen shows the violet colour of the spark, and here again it is proved that absolute white is very rare; white paper always has a yellow or a blue tint. There is no better means of easily recognising a feeble objective tint than this rapid succession of opposite colours. A dead black which we used showed a saturated blue succeeded by yellow.

With these two phases of the phenomenon we clearly have two components, viz., the white light and the colour. The white light (the brightness) we cannot isolate, because the spark, as well as a white screen, are always more or less coloured. On the other hand it is possible to diminish the intensity, whilst the colour remains pretty nearly unaltered, and so becomes more saturated. We effected this by applying between the screen and the observer's eye, or between the spark and the screen, coloured glass plates of the same colour as the observed screen. The white light then considerably diminishes, whilst at the same time the colours, both for the first and the second phase, are seen to greater advantage. Already Aubert had noticed,[1] that the positive after-image, by means of the electric spark, lasts longer with feeble than with intense illumination. Exner even lays down the rule: "Je schwächer die Reizung, desto länger das Nachbild." The feebler the stimulation the longer the "after-image," which rule, however, naturally only holds good within certain limits. The truth is, that these phases of the after-image are more clearly perceptible when the white light diminishes, *i.e.*, when the colour becomes more saturated.

These two phases are succeeded by a third phase which is of much longer duration, and shows entirely different phenomena. The after-image now arising, though corresponding with the original image in shape and size, is very feebly coloured, mostly of a reddish brown, as of brick, more or less resembling the colour of the illumined pupil.

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[1] Aubert, *Phys. Optik.*, p. 512.

Sometimes it is hardly possible to define the colour; it seems to be a mixed one, still in a measure resembling brick colour. As long as this brown after-image exists, there is anæsthesia for objective light. As such we used luminous paint, with which the observed plate is covered. As long as the brown after-image remains, the luminous plate seems quite extinguished, provided the eye keeps immovably fixed on it. If, on the contrary, the eye is moved, so that the image is thrown on another part of the retina, the light reappears at once, and shows the original brightness immediately, whereas when it is fixed immovably, the image returns slowly and gradually.

This third phase of the after-image corresponds, as far as the time of the origin and the duration of its existence are concerned, with the more commonly studied after-images, which arise by long continued looking at a bright object and its projection on a white surface; thus, for example, if we look at a coloured ribbon on a bright surface, and then quickly remove the ribbon, we observe, after a very short interval of darkening, which corresponds to the second phase, an after-image of the opposite colour.

This after-image lasts longer in proportion as the fixation had been more perfect, and, consequently, also longer, than with the illumination by the electric spark. But it seems certain that both these after-images represent corresponding phenomena of the retinal function.

Also with the last-mentioned after-images we observe a successive disappearing and reappearing of the phenomena.

IV.

This interesting succession of light and dark of the after-image can also be seen with the direct image of a very feeble light, if we look at it in a completely darkened room.

If, *e.g.*, we continue for some minutes to look at the feeble light of an illuminated point, it slowly fades, and disappears altogether. But with the least motion of the eye it suddenly reappears.

If we take care that we do not move the eye, and that

we remain viewing the same spot, we shall also see the light reappear ; but this time not suddenly, the brightness returns gradually and slowly.

After some time it fades again, and so we obtain a continual slow succession of light and of darkness.

From the succession being a slow or a quick one, we can infer whether the reappearance of the image is the result of a movement of the eye, or whether it be due to a local alteration in the retinal perception.

It seems to me, that these phenomena are to be looked upon as a clear example of the reciprocal effect of the adjoining parts of the retina upon each other.

According to Hering's theory there is a continual reciprocal influence between the spot of the retina where the image is observed, and the adjoining parts. This influence is due to a modification of the visual substance, which, according to Hering's suggestion, will perform an alternate dissimilation and assimilation. It does not seem unlikely that dissimilation and assimilation can temporarily become equally great, and by reciprocal influence neutralise each other.

The varying increase in brightening and the gradual fading away would then have to be attributed to a struggle between dissimilation at the spot of the retinal image, and assimilation in the surrounding retina.

We undoubtedly are indebted to Hering's theory, in that it enables us to compare and account for widely diverging phenomena much better than we could do before.

This helps us to appreciate these seemingly unimportant facts, and may stimulate us to continue by all the means in our power the investigation of the processes of retinal perception.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

E. Nettleship, F.R.C.S., President, in the Chair.

Thursday, June 11, 1896.

Leucosarcoma of Choroid.—Dr. Rockliffe (Hull) read notes of this case. The patient was a man, aged 42, who had previously had a fall on the occiput. Three years afterwards he fancied he saw "black specks" before his eyes, but no inconvenience was remarked until nine months later, when he discovered it was necessary either to close the left eye or to hold a book slantingly in order to read with comfort. He had a good family history, and always enjoyed good health. His vision when he was first seen was normal in the right eye and in the left $\frac{6}{36}$; with + 1 D. = J. 4. Tn. pupils active, fields normal. No scotoma; colour sense good; fundi normal. The above condition continued, with the exception of increase of defect of vision, for two months, when the perimeter showed a defective field, and the retina was loose around and below the yellow spot. A fortnight later the retina showed marked detachment with defined margin, extending from above the yellow spot downwards nearly to the periphery, and almost to the optic disc. There was no other symptom of orbital tumour. No choroidal vessels to be seen beneath the detached retina. Tn. no tremulousness of iris. Sarcoma of the choroid was diagnosed, and immediate excision advised. This was done four months after he had first noticed defect of vision. The specimen (shown) exposed a round-celled unpigmented sarcoma, measuring 13 mm. by 4 mm., beginning at the outer side of the disc in the deeper layers of the choroid. The author alluded to several recorded cases,

and said he thought that leucosarcomata of the choroid usually originated from the deeper layers of the choroid, at the posterior pole of the eye; that they were not easily diagnosed in their earlier stage; and, although they seemed to occur most commonly in the adult eye, the age at the time of onset might vary from 20 months to 70 years, and their development was usually rapid. He estimated that about 1 in every 100 cases of sarcoma of the choroid was unpigmented, and that the majority proved fatal by metastasis.

Mr. Marshall had been surprised to find leucosarcoma so common: he had found it in 22 per cent. of the cases he had examined. Messrs. Lawford and Collins had found a percentage of 11, in the cases they had collected.

Mr. John Griffith had found 8 cases unpigmented among 35 cases of sarcoma of the choroid. He thought their origin was from the chorio-capillaris, and not from the deep layers of the choroid.

The President said the difficulty of diagnosis in this case lay in the great extent of the tumour and its want of thickness; it emphasised the importance of estimating refraction carefully in cases where the vision had undergone a change.

Cataract Extraction and Gout.—Dr. Rockliffe described this case. The patient, six hours after the operation, had alarming and copious hæmatemesis, followed on the second day by an acute attack of gout in the hands and feet, and intense chemosis of the conjunctiva on the sixth day. The patient, however, made a good recovery from the extraction, and on May 15th, two months after the operation, his vision was $\frac{6}{9}$ and J. 1, and he had read the lessons in his village church on the Sunday previously, with the aphakic eye, with the greatest ease.

The President thought that an acute attack of gout following cataract extraction was not very uncommon, even among hospital patients; he had seen it several times.

Mr. Lang had had about four cases where patients had

had an acute joint attack just after cataract extraction; in none of them had there been any ocular manifestations of gout.

On the Origin of Ruptures in Detached Retinæ.—Mr. Treacher Collins read a paper on this subject. He first referred to the views of Graefe and Raehlmann, that the ruptures were due to pressure of the subretinal fluid, and of Leber and Nordensen, that they were produced by traction on the retina from shrinking bands in the vitreous. He then read an account, and showed some lantern slides of two specimens, which afforded definite anatomical proof of the occasional formation of these ruptures in the way suggested by Elschnig from the appearances seen by him in two cases he had examined ophthalmoscopically. In each of the eyes described by Mr. Collins the retina was apparently completely detached and lay folded in the centre of the globe. In each he had found, however, on microscopical examination, a patch of atrophied retina intimately adherent to the choroid in the yellow spot region, and completely isolated from the rest of the retina. It would seem, therefore, that in these two cases there had first been some central retino-choroiditis which had so firmly united retina and choroid over a localised area that, when the retina subsequently became detached, the adherent patch of it tore away and remained sticking to the choroid, a hole thus being formed in the detached retina.

Mr. Lang had had three cases of detachment of the retina in which there had been holes in the yellow spot region. He asked whether the adhesions occurred elsewhere than at the yellow spot; in many of the ruptures there was no loss of the retina, only a rupture.

Mr. Collins admitted that there were other methods of detachment besides the one he had described; he merely wished to give this anatomical evidence in support of the theory of Elschnig.

Cyst of Orbit.—This case was read by Mr. Doyne for Mr. W. E. Cant, of Jerusalem. The patient, a man, came to

the British Ophthalmic Hospital, Jerusalem, with proptosis. Vision was not much impaired. There was a firm solid substance overlying the site of the lacrymal gland, and deeper than this a fluid tumour was felt occupying the orbit and passing through the bone to the temporal fossa, so that the eyeball became more prominent with the movements of the jaw. The tumour was incised, and found to be a cyst lying beneath the periosteum in the outer wall of the orbit; the bone beneath it and the temporal fossa had been absorbed. After considerable delay the cavity granulated up.

Dr. Argyll Robertson said that dermoid cysts of the orbit adherent to the bone often caused great difficulty. It had been suggested to him by Dr. Robertson, of Singapore, to make a free incision into them, evacuate their contents, and insert a small piece of lunar caustic. By this means, after a few days, he had found the cyst come away entire.

Acquired Nystagmus in other Occupations than that of Coal Mining, with Cases and Remarks.—This paper was read by Mr. Simeon Snell, of Sheffield. The labour bestowed in recent years on the investigation of the etiology of miners' nystagmus, was bearing fruit in demonstrating the existence of a similar occupation neurosis in the workers in other employments than that of coal mining. The constrained position in which the collier worked would, perhaps, remain *par excellence* the most conducive to the production, in frequency and severity, of acquired nystagmus, but the case he related showed that nystagmus and weariness of the ocular elevators were already to be found in a variety of occupations. He referred to the interesting historical fact that the eyes of Michael Angelo suffered when he was painting the roof of the Sistine Chapel from the constrained attitude he was compelled to occupy at his work. Other painters had suffered in the same way from a similar cause. Mr. Snell mentioned that since recording his case of nystagmus in a compositor in 1891, 12 other patients, 5 of them compositors, had come under his observation. Three

cases had been communicated to him by Mr. Priestley Smith, and 3 by Dr. Simons (Merthyr Tydvil), and Nieden had recorded an instance of acquired nystagmus in a plank cutter. The total number of cases referred to in the paper was 19, and comprised 6 compositors, 2 metal rollers, a platelayer, a plank cutter, a saw maker, a sanitary tube maker, a fitter, an ironfounder, a worker in a "cage" at a mine, 2 workers at a glass factory, a youth engaged at a confectionery warehouse, and a man employed at the screens at the surface of a coal mine. They varied much in degree, and in some there was more weariness of the ocular elevators than very noticeable nystagmus; but it was held that, as in the case of miners, the oscillations would have been more marked if the examinations had been made when the patients had been at work for some time. Generally speaking, the nystagmus was less pronounced than that met with in miners. Mr. Snell thought that, attention having been drawn to the matter, nystagmus and strain or weariness in the elevators will be much more widely recognised as caused by different employments than is the case at present. The plan of investigation advocated was to get the patient to place himself in the position in which he worked, or better to see the patient actually at his employment. In conclusion, Mr. Snell remarked that he thought a main factor in the causation of "Academy headache" was the weariness induced in the ocular muscles by turning the eyes so frequently above the horizontal line. This could be compensated for by a backward movement of the head.

Card Specimens.—The following were shown: Mr. Secker Walker: (1) Tumour of Optic Nerve. (2) Cysticercus of Conjunctiva.—Dr. Bell Taylor: Cases of Cataract Extraction without Iridectomy.—Mr. Silcock: Lymphangioma of Orbit.—Mr. Lawford: Pigmentation of Conjunctiva.—Mr. Marcus Gunn: Acute Bullous Eruption with associated Affection of the Conjunctiva.—Mr. Juler: Macroblepharon.—Mr. Holmes Spicer: Acute Double Optic Neuritis.

After the ordinary business of the Society had been concluded, the meeting resolved itself into the Annual General Meeting, for the transaction of official business. The reports of the various officers were read and approved, several alterations in the bye-laws of the Society were proposed and carried, and the office-bearers for the ensuing year were elected.

ON RECURRENT OCULO-MOTOR PARALYSIS

By Dr. Gustaf Ahlström, Gothenburg, Sweden.

In view of the interesting article on recurrent paralysis of the ocular nerves, by Dr. Ormerod and Mr. Holmes Spicer, an abstract of which was published in the March number of this journal, I venture to bring forward a case in many respects very similar, and which is the more interesting as the exciting cause of the paralysis seems to me to be tolerably clear.

Mr. R., aged 50, consulted me for the first time in February, 1894. He had always been healthy except when his left eye had troubled him some three years before. On that occasion, he says, he suffered in very much the same way as when I first saw him. The attack lasted three months, after which he completely recovered.

A few days before his first visit to me he had double vision and experienced some difficulty in raising his left eyelid. At the same time he had severe pain on the left side of the head, and the intensity of these symptoms was increasing.

His condition at the time when I first saw him was as follows. There was almost complete ptosis on the left side. The left eye diverged greatly and could only be moved a little inwards. Power of movement upwards and downwards was abolished. Pupil widely dilated. V. = $\frac{6}{6}$; fundus normal. There were no signs of inflammation in the eye or surrounding parts.

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Pressure on the globe caused moderate orbital pain, but the patient complained greatly of an intense and nearly constant neuralgia on the left side of the head and forehead. A spot particularly sensitive to pressure was that over the left supra-orbital foramen. Fomentations, antefebrin, electricity, &c., were used, and the paralysis and headache both gradually passed off, so that in two months' time the patient was almost well. He remained well till January, 1895, when, after a bad cold, his previous symptoms recurred. There was again considerable ptosis and great divergence, but the pupil was now normal and responded briskly to light stimulus (direct and indirect). Accommodation normal and field full; V. $= \frac{6}{6}$. Again there were severe pains on the left side of the head. The previous treatment had no effect.

The patient at this time happened to mention that he had had a slight discharge from the left nostril for several years, but that each time his eye became affected this discharge ceased and left the nostril feeling rather dry and uncomfortable. This information naturally led me to make a careful rhinoscopical examination, but nothing pathological was discovered except that the middle turbinal was covered with a thick layer of dried mucus. I suspected, however, the existence of a latent catarrh of the frontal sinus with a stoppage of the fronto-nasal duct, and I accordingly endeavoured to revive the discharge, and therefore prescribed frequent nose douches of tepid salt water, and the repeated use of snuff in the nostril. The effect of this was soon evident. The secretion from the nose was re-established in a few days, the headache entirely disappeared, and the paralytic symptoms rapidly diminished. Since then he has, on two occasions—each time after having caught a cold—had warnings of the approach of a similar attack, but, in accordance with my advice, he immediately began the treatment

described above, and in a few days all discomfort ceased. His previous experience of these attacks—of the headache, diplopia in certain positions of the eye, and general uneasiness, accompanied as they always are by a cessation of the nasal discharge—has rendered him peculiarly sensitive to their onset, and there is no likelihood of his mistaking any other catarrhal affection for this particular form of disease. His evidence, therefore, may be taken as perfectly trustworthy.

The relation between the oculo-molor paralysis and the catarrh of the sinus frontalis, I, for my part, consider to be indisputable. And of late, as has been shown in other cases, a certain relation between diseases of the nose or its cavities and the eye has been fully borne out. Trousseau,[1] for instance, was able to overcome a unilateral mydriasis by simply cauterising ulcerations of the nose, and to cure "migraine ophtalmique" by extirpation of a couple of nasal polypi. Moreover the existence of a real accommodative asthenopia of nasal origin has been observed in several instances. Kibbe[2] relates a case where the patient suffered for many years from considerable accommodative asthenopia and violent cephalalgia in connection with insufficiency of the internal recti, and where the symptoms disappeared once for all after the removal of the hypertrophied middle turbinated bone.

But in the case related by me how are we to explain the connection between the catarrh of the frontal sinus and the oculo-motor paralysis? Of course in trying to answer this question a certain amount of hypothesis is necessarily involved, but I am inclined to consider the following explanation as most probably correct.

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[1] Société d'Ophtalmologie, April, 1889.
[2] *Medical Record*, April, 1892.

Judging by the phenomena already described, I am of opinion that the nerve lesion is to be looked for rather in the nucleus than the trunk of the nerve. An organic change can hardly be considered as possible, as not a trace of the paralysis is to be found during the intervals between the attacks. According to my idea, the cause is to be sought for in anomalies of circulation in the region of the oculo-motor nucleus by which more or less of its nerve branches become functionless. This anomaly I believe to be a reflex phenomenon. The catarrh of the sinus frontalis and the obstruction to the escape of the nasal secretion would cause an increased pressure on the mucous membrane and on the numerous ends of the trigeminal nerve : the irritation of these nerve endings would be transmitted to the corresponding nerve centres, and would thus, through the branches of the trigeminal, indirectly give rise to the various phenomena associated with fifth-nerve affections—anæsthesia, hyperæsthesia, &c. At the same time it seems to me probable that, from the same cause, other nerve centres might be so affected as to give rise to ocular symptoms—local congestion, &c.—as for example, in the case of the iris, hyperæmia of which has been ascribed to irritation of the branches of the trigeminus in disease of the nose.

The cephalalgia may be accounted for by the pressure brought about by the increased secretion in the sinus due to the blocking of the fronto-nasal duct.

C. Normann-Hausen (Copenhagen). A Shot Injury of the Orbit. *Centralblatt für Augenheilkunde, March*, 1896.

Mr. L., aged 39, and in good health, shot himself with suicidal intent on April 26, 1895, the ball, whose diameter was 7 mm., entering the right temple. He was at once taken to a hospital, where he was found to be perfectly sensible, answered questions intelligently, and complained only of a burning pain in the right eye and right half of the head. Three cm. above and to the outer side of the outer canthus was a wound, 4 cm. in length, three-cornered, blackened with powder and somewhat ragged. There was a gap in the zygomatic bone, and a sound passed without obstruction about 14 cm. downwards, inwards and forwards. The right eye was closed, there was much ecchymosis in both eyelids and in conjunctiva, the pupil was dilated *ad maximum*, there was absolute immobility of the eye and no p.l.; the interior of the eye was filled with blood. In the left eye nothing amiss was to be found except a certain amount of ecchymosis in the lower lid and anæsthesia over the whole area of distribution of the infra-orbital nerve.

No cerebral symptoms followed, recovery being quite undisturbed. Ophthalmological examination ten days after the injury gave the following results: all movements of the right eye fairly free, except outwards; light perception exists, but projection is bad. Through the remains of the blood clot in the retina and round the disc one could make out a broad rupture of the choroid extending upwards and outwards from the papilla itself; the disc presented the aspect of severe neuritis. In the left eye there was no paralysis; the pupil was dilated, but reacted to light, the fundus all over presented the whitish, woolly appearance with diminished vessels which characterises œdema of the retina. With this eye he could count fingers at twelve feet distance. The field of vision was restricted in all meridians. As time went on the condition of the right eye remained unchanged, while the vision of the left

gradually degenerated until one month after the injury he could only count fingers at six feet. At the same time the field was restricted to a quarter of its usual extent in every direction, while the fundus continued to present the same appearances as before; perhaps the pallor had somewhat increased. The patient now was able to spend the day in the open air, and gradually vision again began to improve. In seven weeks from the time of the injury he was once more able to count fingers at twelve feet; in a fortnight more he had $\frac{6}{18}$, and the field was enlarging concomitantly. But accommodation remained very deficient, though reading was daily practised. On his return home three months after the injury, slowly progressive atrophy of the right eye set in with a small field of vision upwards and outwards, within which area he was able to count fingers at one or two feet distance; the pupil was strongly contracted, the eye was deeply sunk in the orbit from atrophy of the orbital contents, the tension was markedly reduced. Ophthalmoscopy showed the choroidal rupture and a disc now quite pale. The left eye showed normal vision and field of vision; he could without difficulty read and write. The fundal appearances were normal, but the anæsthesia over the area of the left infra-orbital nerve was still unchanged. An examination in January, 1896, gave the same results; the atrophy of the right eye was more complete, and the eye was blind and soft, with a small pupil.

In this case, therefore, the pistol bullet had passed into both orbits, injured the right globe close to the insertion of the optic nerve, part of which it had perhaps torn away; it had then passed along the floor of the left orbit, travelling downwards and forwards, had destroyed the infra-orbital nerve, caused commotio retinæ, and probably embedded itself in the left zygomatic bone. No attempt to find or recover the bullet was made. It is interesting to observe that the symptoms caused by the commotio retinæ increased for nearly six weeks and then slowly passed off, leaving perfect vision.

W. G. Sym.

CHARPENTIER (Nancy). Luminous Sensibility at the Fovea Centralis. *Archives d'Ophtalmologie, June*, 1896.

Professor Charpentier has from time to time directed his attention to the study of vision at the central part of the retina, and in this article proceeds further with his investigations. In testing the minimum visible object he showed that the luminous sensibility, uniformly developed over most of the general surface of the retina, was very feeble in a central zone whose limits corresponded pretty exactly with those of the yellow spot. This is a fact which has long been known to astronomers, who are well acquainted with the fact that stars just within limits of visibility are better seen in very slightly oblique vision. Charpentier finds this inferiority to be true not merely of the perception of white light, but also of the colourless perception which all pure colours produce (especially those near the more refrangible end of the spectrum) at the limit of visibility. But as regards chromatic perception proper, this, on the contrary, is more and more acute as one approaches the centre; blue however is badly recognised at the centre. As he pursued the subject he found that over one minute area much smaller than the yellow spot, all colours, whatever they might be, were badly appreciated. The yellow spot or macula has a diameter of 2 mm.; the fovea may be one-tenth of this, but is less exactly defined; at a distance of 25 cm. these will give circular areas 3 cm. and 3 or 4 mm. in diameter respectively. He finds that every simple light presented to the eye with an intensity increasing from zero, produces first a colourless sensation, then as the intensity increases, one of colour, and suggests that one should use the term "photo-chromatic interval" to express the interval or relation between these two critical intensities. One fact in this connection which he has noted is that the interval diminishes as one passes from periphery to centre. At the very centre it becomes so minute that some have thought it non-existent, that is to say, they believe that

a pure colour, however feeble its intensity, shows always as a colour when seen by the very centre; that it excites no colourless, merely luminous sensation as it does over other portions of the fundus. The examination of the minimum perceptible is generally carried out in complete darkness. One single luminous object is presented to the eye at the limit of perception. Now under these circumstances the eye has a very imperfect knowledge of the true situation of the object, but endeavours to direct to the object that part of the retina endowed with the maximum of sensitiveness, viz. (in the case of simple luminous sense), not the fovea but the portion of retina immediately surrounding the yellow spot, so that it is regarded in excentric vision. But if details have to be made out, then the fovea itself is directed to the object; and if it be required to perceive colour, the object is regarded *almost* directly, the area immediately encircling the fovea being utilised. These minute deviations and movements often take place, and that unconsciously in the dark. Those who have devoted attention to the determination of colour perception according to this minimum perceptible method have observed, as well as Charpentier, the following phenomenon. There is presented to the eye a small luminous point, red or green, closely approximating to the limit of visibility. This is recognised to be coloured (by the margins of the fovea), when all at once, generally in consequence of a voluntary effort to fix the point in direct vision, it disappears. Now according to Charpentier a mistake is apt to be made here; it is supposed that the impression limited to the centre is a coloured one, but the truth is that the actual fovea has a distinctly higher minimum of visibility than the surrounding parts. Similarly when one is endeavouring to find out the minimum of visibility of one's own macula by direct experiment, it is well nigh impossible to avoid so very slight a movement as will bring a more sensitive portion momentarily in line, and the spot is then seen and the colour diagnosed.

The author has cast about to find some means of keeping the gaze exactly fixed, and believes that he has achieved

this result by the following method. He places in the dark chamber, and on the same level as the object to be studied, and not far from it, a rather larger and slightly more illuminated object; it is, generally speaking, best that this should be white, but it may be of the same colour as the test object. He arranges matters thus: if he has decided to use coloured glasses (to begin with, this method is not so difficult of management as when spectral colours are dealt with, and one can obtain perfectly pure colours, especially red, which, as it happens, is the colour whose photochromatic interval has been most thoroughly investigated), he arranges a sheet of opaque black paper in which there is an aperture two- to three-tenths of a millimetre in size, the puncture being covered by a piece of the tint fixed upon; to the side of this aperture he makes another larger one, perhaps 1 mm. in size (round or square), about $1\frac{1}{2}$ to 2 mm. distant from the former. This second puncture is covered with white paper, and is so designed that it is visible under an illumination distinctly but slightly less than the first. This whole apparatus—the screen with the punctures—is placed at the end of the tube of Charpentier's photoptometer for graduated illumination. It is indispensable that the eye should be correctly adapted, by a lens if need be, for the distance at which this object is placed; accommodation must be in abeyance. Under these conditions, the gaze will be fixed upon the white object barely visible under the feeble illumination, and the state of the fovea proper can be exactly tested. When this is carefully done there remains no doubt; in an area of 2 to 3 millimetres in diameter corresponding to the fovea, the minimum of colour perceptible is distinctly inferior to that of the neighbourhood, and becomes worse towards the central point; and further, before the coloured point is seen to be coloured, *i.e.*, under feebler illumination than will suffice for this, it is seen as a colourless spot. This is specially observable for red. In this very minute area, then, the photochromatic interval exists, though it is extremely attenuated, and it increases—which one would hardly have expected—when

the eye is allowed to repose for a time in the dark. These facts can also be established if, instead of employing a white "fixation" object, we use a coloured one, and to meet the objection that perhaps our minute colour object was not pure in tint, employ spectral colours. One has only to place in the area of dispersion of a spectroscope just such a screen as was employed in the former experiment, making the apertures as above in the same area of the spectrum ; the result is entirely similar. It will thus be seen, says Charpentier, that Koenig and Parinaud are wrong in asserting that in the extreme central area colourless vision is absent, but the photochromatic interval for red is very minute.

It is to be noted that this minute region in which colour perception is less acute than in the neighbouring areas is just the portion in which visual acuity, in which perception of detail, is carried to its maximum, as one can prove in numerous ways, notably by counting extremely fine needle punctures under an illumination which baffles any of the neighbouring parts of the retina.

Certain important conclusions, according to Charpentier, result from these experiments. In the first place, the primitive luminous sensation, which is the foundation of retinal stimulation, preserves its capital importance, and the white (or colourless) sensation, instead of being a resultant of several sensations, as Helmholtz's theory requires, is, on the contrary, the simplest sensation possible. In the second place it is not attributable to excitation of rods more than of cones, since it takes place not merely at the yellow spot, where the cones are almost unmixed with rods, but at the actual fovea, in which also rods are unquestionably absent. That being so, one can hardly say that it is necessarily connected with the presence of retinal purple, though Charpentier used to be of that opinion. Indeed it is not easy to say what the precise function of the retinal purple may be ; it is itself visible under suitable conditions, and it is inconceivable that the retinal purple can see itself. It is doubtful whether it can have an immediate and essential function in regard to vision, but

that is not to say that it plays no part, and it is possible, as Parinaud thinks, that it may be concerned in nocturnal vision. One can only fall back on hypotheses, with which we need not trouble our readers. But if there are presented to the light, to be acted upon by its two elements, two distinct structures, of which one predominates at the centre, and the other, less in quantity at the centre, is uniformly scattered over the rest of the fundus, the sensation of colourless light would result from excitation of one alone, while the sensation of colour would result from their simultaneous excitation, and would, in the judgment of Parinaud, be intimately associated with the difference in the two effects.

W. G. Sym.

L. Bach (Wurzburg). Antisepsis or Asepsis in Operations on the Eyeball. A Study in Comparative Bacteriology. *Archives of Ophthalmology, xxxiii.*, 1 *&* 2, *p.* 1.

By comparing his own results, previously published, with those of Franke, Bach came to the conclusion that, for the purpose of asepticising the conjunctiva, mechanical cleansing is far more effectual than simple douching with antiseptic solutions. The question remained whether any differences were observed between the antiseptic and the aseptic modes of procedure. For this purpose, douching was carried out, combined with the mechanical cleansing of the palpebral margins and the conjunctival sac, on the one hand, with a solution of sublimate, 1 to 3,000; on the other, with the so-called physiological solution of NaCl ($7\frac{1}{2}$ to 1,000).

The experiments were carried out in this way: after instillation of a few drops of cocain solution, the palpebral margin was gently scraped with a platinum spatula, while the contents of the conjunctival sac were taken up by a

platinum wire loop. The contents of the loop and those of the spatula were then grafted upon agar.

A controlling experiment was then made in exactly the same manner, with this difference, that a scrupulous cleansing of the palpebral margin and the conjunctival surface was carried out in the one set of experiments with a solution of sublimate (1:3,000), in the other with NaCl $7\frac{1}{2}$:1,000). The details of the cleansing are fully described in the original.

The results are given in two tables, and show that the reduction of the number of germs on the palpebral margins and in the conjunctival sac is far more safely and surely effected by irrigation when combined with mechanical cleaning than by irrigation alone; further, that the effect of the antiseptic and the aseptic solutions was practically the same. For this reason Bach gives the preference to the aseptic solutions, as they irritate the conjunctiva much less than antiseptic solutions, which, to be effectual, would have to be of a strength that would be injuriously irritating to the eye, producing strong vascular injection, more or less marked œdema of the conjunctiva, and increase of secretion—in fact, a catarrh which is certainly not favourable for operative interferences.

Moreover, the application of sublimate solution before an operation is of so short a duration that a strong germicide effect cannot possibly be expected from it; and the idea that some of the sublimate may remain in the conjunctival sac when the lids are bandaged up after the operation appears altogether without foundation when we remember that the tears are drained through the lacrymal duct in spite of the bandage.

In conclusion, Bach expresses himself uncompromisingly in favour of asepsis as against antisepsis. The irritation of the conjunctiva produced by the mechanical wiping of the conjunctival sac has led him ultimately to give up this manœuvre altogether, and his mode of preparing the eye for a cataract operation is briefly as follows: cleansing of the outer surface of the lids and the surrounding parts with soap and warm water, followed by wiping the lid-

margins with sterilized cotton and irrigating with physiological salt solution. The patient is then directed to close and open the eye repeatedly, for the purpose of removing as much as possible of the contents of the conjunctival sac; then the palpebral margins are wiped dry again, irrigation follows once more, and the part selected for the incision is gently wiped. It need hardly be said that sterilised instruments must be used. In this way, Bach is of opinion that the danger of infection after the operation need not be feared, while it can be avoided with certainty during the operation. K. G.

GUILLERY (Cologne). **On the Amblyopia in Strabismus.** *Archives of Ophthalmology, xxxiii.*, 1 *&* 2, *p.* 45 (*German Edition*).

The question whether the amblyopia so frequently met with in squint is the cause or effect of strabismus has never been settled yet, in spite of a vast amount of observations published *pro* and *contra*. Observations telling in favour of one side have been discredited by those who favoured the other side, and it must be admitted that observations are very easily misinterpreted, even when based on unshaken facts. To give an instance: the fact that an eye can improve by learning to see, and thereby to interpret visual impressions better than before, does not necessarily imply an improvement in the acuteness of vision itself. For these reasons, the author has endeavoured to throw some light on the question by studying the visual field of amblyopic eyes in strabismus.

The generally-accepted idea that this amblyopia is characterised by an unrestricted visual field, normal colour perception, and normal ophthalmoscopic appearances was challenged some five years ago by Hirschberger. He came to the conclusion that large peripheral sections of the retina may lose their functions by "suppression of the image," not only in the squinting, but also in the other

eye, and that no common visual field exists either in divergent or convergent strabismus, the excitation of the one eye leading to suppression of the image in the corresponding parts of the field of the other eye.

But there are such strong objections to the mode of observation applied by Hirschberger that it seemed superfluous to repeat his experiments; for, even if the results had been the same, they would not have admitted of the interpretations he put on them. However, the question whether restrictions of the visual field occur in strabismus through disuse is of the utmost importance.

The large number of observations made in the past speak in favour of an absolutely intact visual field in most cases. But it would be easy to raise the objection to all these observations, that the result was arrived at by an unreliable method. Before the introduction of the perimeter, the testing object used to be the hand of the examiner in motion, and later in the perimetric period square or round discs of white paper were employed, of such a size that an accurate determination of the acuity of vision for the retinal periphery was quite out of the question. It was, therefore, easy to overlook a restriction of the periphery of the visual field when it was in reality present.

A few years ago Groenouw examined the acuity of the visual field by the perimeter employing not the old white or coloured squares, but small spots from $\frac{1}{4}$ to 4 mm. diameter. The boundary lines of the field in which objects of a certain diameter are recognised as such by the normal eye were called—for want of a better name—"isopters." These isopters, or isopteric lines, have the form of an ellipse with the long diameter horizontal, somewhat parallel to the boundary lines of the normal visual field.

Guillery has improved this method by placing the minute object on one corner of a visible square, so that the examinee can be asked in which corner of the square the object is. Mistakes or self-delusions can thus be easily excluded.

He selected as test objects discs of 1 mm. diameter. Smaller discs give the isopteric line too near the fixation point; and for cases of reduced peripheral vision they would be quite useless. Larger sizes than 1 mm. would, on the other hand, not be suitable for the detection of slight functional restriction. For 1 mm. the isopter runs about midway between the fixation point and the boundary of the normal visual field, at a distance from the physiological centre far enough to show any reduced acuteness of vision in the periphery.

The test object—a white square with a black dot in one corner—was invariably moved in a centripetal direction. The eyes showed no abnormal ophthalmoscopic appearance. In all cases of strabismus examined in this manner no binocular vision ordinarily existed, so that the conditions were favourable for the development of deleterious results of suppression if such existed; moreover, the cases selected were all long-standing cases of convergent strabismus, dating from childhood, and quite stationary at the time of examination.

Full accounts are given of five typical cases examined in this way. In all these instances it was found that no relation could be traced between the visual acuity of the centre and that of the periphery. Exactly the same independence was found by Guillery in cases of divergent strabismus, of which, for the sake of brevity, he does not give any detailed description.

The conclusions arrived at by Guillery are not favourable to the theory of deterioration of sight by disuse. It would be difficult to imagine an injurious influence acting on both centre and periphery of the retina and yet affecting both very unequally, leading sometimes to greatly-reduced central vision with the periphery intact, sometimes to the opposite condition, or to any combination.

In view of these observations, amblyopia in strabismus cannot be explained by one cause only acting in every case, but is probably due to a variety of causes. Some of these Naumoff, who examined recently the intraocular changes occurring in the new born, claims to have found.

He found small vacuoles in various layers of the retina, retinal œdema, choked disc, and often extravasations in the region of the yellow spot and its neighbourhood, more rarely in the choroid. As they were found most frequently in the case of first-born children, especially after a difficult labour, Naumoff is inclined to interpret them as the result of intra-cranial venous stasis and consecutive thrombosis, which he believes responsible for at least some cases of congenital amblyopia.

K. G.

E. JAVAL. Strabismus, a Manual (*from Centralblatt für praktische Augenheilkunde, June*, 1896).

(*Continued from page* 148.)

PART II.

Javal next proceeds to deal with the different varieties of strabismus. Myopia tends to produce, in different ways, both divergent and convergent strabismus. To take convergence first, though it is much the rarer form :—this may arise in a patient with high myopia of equal degree in the two eyes if he is not in the habit of wearing glasses when reading. In order that he may see clearly (and binocularly) he converges strongly, the internal recti thus gradually acquire a permanent superiority and finally diplopia for distant objects is set up. In order the more to separate these two images the patient squints inwards; to express it in a different manner, there is alteration in the situation of convergence without any (necessary) alteration in the amount of it, the near point being nearer than is normal and the far point being no longer at infinity. Javal has been able to cure this condition by exercises which aim at withdrawing the zero point of voluntary convergence further from the eyes; in other cases, again, an operation is indicated which has for its aim the setting back of the area of single vision, and this operation is usually attended with very good results.

Myopia of high degree tends greatly towards divergent

strabismus. A patient with myopia of high degree is obliged to bring his book very close to the eyes, and if one eye possesses less sharpness of sight than the other, or is less astigmatic, or less myopic, vision may cease to be binocular, and that eye deviates outwards, a tendency which is furthered by the natural disposition of the eyes towards divergence. The eye now no longer converges, and the condition known as relative divergence becomes established.

Javal thinks that the amount of myopia in the two eyes is nearly always equal, even when one is astigmatic, if one corrects the astigmatism by a *convex* cylinder. On the other hand, the degree of myopia in the eye used for near purposes is apt to increase, and in this way the inequality in refraction may become more marked. Divergent strabismus passes through a stage incorrectly named "Insufficiency of the Internal Recti," in which there is squinting for near objects. There is nothing to be gained by convergence, for the blurred image of that eye would only confuse the good image formed on the other, and the external rectus is employed to move the eye further into the realm of divergence so as to separate further the troublesome double images. And when the eye used for near vision becomes too myopic for distant vision to be reasonably fair, then absolute divergence is established. Treatment in the early stages consists in the *constant* use of such glasses as are adapted for 33 cm. (far point); these must be worn for reading also; in the higher degrees the controlled "Reading Lessons" and stereoscopic exercises are useful, preceded, when absolute divergence is present, by an operation.

A chapter is devoted to the so-called muscular insufficiency, which Javal looks upon as a condition of not very rare occurrence, which may be congenital, and may be the cause of a divergent strabismus. In most of the cases, however, the insufficiency, which is rather apparent than real, is curable by correction of the optical errors. With these premises, treatment by prisms or tenotomies is not to be thought of; he relies, in the earlier stages of so-called

insufficiency, upon correction of the anisometropia; in later and worse stages he employs exercises in convergence as a means of cure, and aims generally at improving the innervations rather than increasing the power of the muscles; the punctum proximum of convergence is brought nearer to the eye. When simultaneous divergence of more than 12-15° occurs, an operation is indicated.

Hypermetropia leads to convergent strabismus in the following manner, according to Javal:—The patient, who is presumed to possess the normal relation between accommodation and convergence, is called upon by a sudden paresis of accommodation to produce an over-convergence; he has then advanced one step towards strabismus. The onset of strabismus is usually shortly after one of those illnesses which are apt to lead to paresis of accommodation (scarlatina, sore throat, &c.). A moderate degree of hypermetropia is favourable to the occurrence of squint; the emmetrope with paralysis of sphincter needs only to converge much when dealing with near objects, while the high hypermetrope, being unable to keep up sufficient effort to obtain clear vision, does not attempt it. At first the squint, which usually begins about the third year, is periodic, and for near objects, by-and-bye becoming present also for distant objects which require sharp vision. In respect of treatment, a great many cases are curable by means of "squint spectacles" worn when the patient is dealing with near objects; accommodative strain is avoided, and by exercises carried on as indicated in Part I. of this Review, with and without the stereoscope, and finally by the binocular reading exercise, the patient attains first to an increase of his binocular field of vision, and at last to complete restitution.

Quite distinct from the periodic convergent strabismus ordinarily met with is the less frequent alternating strabismus; this can only arise when the two eyes possess equal acuity of vision. The mechanism is the same as in the more typical convergent strabismus, but the degree of squint is often high, as, the two images being of approximately equal value, the patient desires to separate them as

far as possible in order to minimise the inconvenience. In such a case operation is distinctly indicated, and Javal expresses the opinion — an opinion which the reviewer does not see his way to accept—that it is well, if one wishes to attain to a really perfect restitution (but only then,—that is to say, when one aims at a result which is not merely a cosmetic "cure"), to produce an *over* correction by operation, in order that the unaccustomed crossed diplopia may assist to force the patient to benefit by the optical exercises.

Permanent unilateral strabismus Javal looks upon as occupying a place intermediate between periodic and alternating squint, the eye selected to be permanently deviated being the worse, that is, the more astigmatic. In regard to treatment, the aim should be first to change the permanent into an alternating strabismus by forcing the patient to use the squinting eye; to attain this, the "squint spectacles" are very valuable; the vision and the fixation power of the squinting eye are thus improved or restored, and the case resolves itself into an alternating or periodic strabismus to be treated on the customary lines. The prognosis depends chiefly upon whether the eye which has been deviating possesses fixation power or not: in this respect the persistence of a *slight* deviation is of particularly evil significance, as indicating that little or no value is placed by the patient upon the image of that eye.

Javal holds the opinion very strongly that the amblyopia, ex anopsiâ, or ex ablepsiâ, which is chiefly displayed by a loss of fixation power, is a consequence, and not, as so many maintain, a cause of squint; and he considers the fact that, except in old standing cases one can almost always obtain a more or less complete cure, to be a proof of this. In a recent case a brief period of use of the squint glasses may suffice; it oftens happens, too, that an operation enables an eye at once to adopt a correct position, which previously had been attained only with nystagmus. There is a particular variety of nystagmus which accompanies strabismus with muscle-weakness, a slow wandering of the eye from the object alternating with a more

rapid return to proper fixation. Muscular insufficiency predicates that a muscle, in order to bring about a certain result, must put forth a stronger effort than a normal muscle would, and this extra expenditure is brought about by a series of jerky contractions. An eye affected with this condition has but one position which it can adopt without nystagmus, it is directed to one certain point, its point of repose. To bring the two points of repose for each eye into one, an operation is frequently called for.

The main body of the book finishes here, but M. Javal, in some remaining pages, discusses one or two points connected with the chief subject. We pass by some of these, but his opinions on the difficult subject of false projection are worth reproduction here. What are the conditions, he asks, which determine false projection? In connection with this, he relates a case in which after an operation, and in consequence of the new attitude of the eye, a new false projection was developed in about a year in place of the former. He draws attention to the fact that in nearly all the cases in which false projection is the accompaniment of nystagmus, the squint is congenital or infantile, coming on before the close of the first year, though there are exceptions to this rule. He divides the cases into three groups:—

(*a*) Patients with alternating convergent strabismus. During fixation by either eye there is a false projection by the other alternately and indifferently. Complete operative correction brings about normal relation of the eyes and normal projection, the false disappearing.

(*b*) The majority of the cases belong to the second group, in which only one eye is used for fixation, and the deviating eye has adopted the custom of projecting objects according to their relation to the *fixing* eye. In such cases central vision in the squinting eye is always under par.

(*c*) The third group includes those anisometropes who use the one eye for distant fixation and the other for near work. The eye not in use deviates and projects falsely. In treatment of false projection operation is indicated so as to bring the faulty eye into such a position that the

patient is forced to endeavour to project correctly; then squint spectacles are employed for a time to "force" (if one may use an agricultural expression) the image of the squinting eye; lastly, the usual stereoscopic and other exercises are employed.

On the question of the cause of diplopia, Javal upholds the "corresponding points" theory. The projection theory gives no explanation of physiological diplopia and the knowledge of the third dimension, though it is supported by the facts of false projection, while the corresponding points theory can explain all. When one fixation point ceases to be functionally active, binocular vision suffers; this damage is transitory in alternating strabismus, permanent in fixed strabismus. The eye soon unlearns to correct an object seen with the fixation point, and great uncertainty in localisation is the result. The relation between corresponding points is, to begin with, congenital, being of the nature of inherited experience; but experience in the ordinary sense plays a great part in the interpretation of retinal impressions, especially the peripheral ones, and upon this is founded our knowledge of the third dimension of relief.

W. G. SYM.

N. ANDOGSKY (St. Petersburg). The Danger of Infection in various Eye Operations, and the Conditions favouring the Extension of Suppuration from the Anterior to the Deeper Parts of the Eyeball. *Archives of Ophthalmology, xxxiii.,* 1 *and* 2, *p.* 11 *(German edition).*

Although the kinds of organisms which produce suppurative processes in the eye and their mode of entrance is fairly well known at the present time, there has hitherto been no enquiry as to how these microbes spread and behave within the eyeball itself.

It is scarcely deniable that antisepsis in ophthalmic surgery has reduced the loss by suppuration in cases of

eye operations to about 1 per cent.; but it is equally certain that micro-organisms are present almost in every conjunctiva after the application of antiseptics, and that every eye operation is performed in the presence of pathogenic and therefore of pyogenic micro-organisms.

Only a comparatively small number of eyes operated upon being attacked by suppuration, it is evident that the eye itself must have to a certain extent the power of overcoming the deleterious influence of the microbes.

It has long been noticed that the various operations show unequal liability to suppuration, and it follows that an investigation into the conditions of the increase and spread of the microbes in the various operations may throw some light on this question.

Andogsky started from the well observed fact that suppuration hardly ever follows an operation in which the lens is left intact, such as iridectomy, while after cataract extraction suppuration sets in not infrequently, starting either from the wound or from the deeper structures. Wecker is of opinion that the aqueous, when saturated with dissolved lens matter, forms an excellent nutritive medium for micro-organisms, while Bach and others have shown the normal aqueous to possess marked bactericidal qualities.

A large number of experiments on the rabbit have been carried out by the author upon the following lines:—

I. *Injections of indian-ink into the anterior chamber, carried out after different operations*, for the purpose of ascertaining the locomotion of the ink grains under the influence of the altered intraocular lymph-circulation.

Hitherto, experimental injections had only been made into the normal eye, in which case the ink is removed from the anterior chamber through Fontana's spaces into the canal of Schlemm and the other parts of the venous plexus of the corneo-scleral region. The ink grains are removed either direct or taken up by leucocytes. They can also be carried into the deep membranes through the ciliary body, and are often taken up also by the cells of Descemet's membrane. They never go from the anterior chamber

into the vitreous, as in the normal eye the lymph current goes from vitreous to aqueous. If injected into the vitreous they mostly go into the anterior chamber through the zonula, round the lens; very few are carried backwards into the lymph spaces of the optic nerve.

In the eye operated on removal of the ink through the spaces of Fontana is retarded, while the corneal wound remains open. In all operations in which the posterior capsule of the lens and the zonula remain intact—in iridectomy and the cases of removal of the lens in which these conditions are fulfilled—the ink does not enter into the vitreous from the anterior chamber. If, however, the posterior lens capsule has been torn, the lymph circulation is altered. The ink enters the vitreous, follows the lymph spaces of the stroma, which, roughly speaking, are arranged in the form of concentric funnels with the apex towards the optic disc, and enters the optic nerve.

II. *Experiments with cultures of staphylococcus aureus in aqueous humour, lens masses and vitreous when taken out of the eye.* These experiments were made for the purpose of ascertaining the nature of these media as nutritive materials for the growth and development of the staphylococcus. It was found that the most favourable soil for the growth of coccus was aqueous humour in which lens masses were dissolved. The growth was very rapid, and began immediately after inoculation, while in the aqueous and also in vitreous free from lens masses, it could be observed to start only after six to nine hours. Andogsky thinks it probable that the fertility of the lens masses is due to their large percentage of albumen (up to 34 per cent.).

III. *Inoculation of cultures of staphylococcus into the anterior chamber of the rabbit.*—The inoculations were made with one day old broth cultures of staphylococcus in various concentrations, containing a large, medium and small number of cocci. A weak dose, injected into the anterior chamber of the otherwise normal eye, produces an irido-cyclitis with fibro-purulent exudation, reaching its height after two days and disappearing gradually without entering the deeper parts of the eye. This favourable result is due: (1) to the

bactericidal influence of the aqueous; (2) to the phagocytosis of the leucocytes, which emigrate into the anterior chamber immediately after the inoculation and swallow up the greater part of the staphylococci within twelve and twenty-four hours, while the rest is taken in by the endothelial cells of Descemet's membrane; (3) to the removal of the cocci out of the anterior chamber, together with the whole exudation through the canal of Schlemm and the perivascular spaces of the venous plexus of the corneo-scleral region. The cocci do not enter the suprachoroidal space nor the vitreous, and in five to ten days the eye is restored to its normal state.

If instead of a weak dose a strong one is injected into the anterior chamber, suppuration of all the membranes of the eye takes place. In these cases the anterior capsule of the lens becomes perforated through the influence of the toxines, the cocci increase in the lens substance and may enter direct into the vitreous, if the posterior capsule gives way.

If the lens has been subjected to needling the inoculation of staphylococci produces invariably panophthalmitis, and much more rapidly so if the posterior capsule has been torn.

Inoculation after iridectomy does not show any difference from inoculations in the normal eye, the iridectomy by itself not opening a new way for the cocci into the posterior parts of the eyeball.

After extraction of the lens, on the contrary, with or without iridectomy, the inoculation of staphylococcus leads within a few hours to a marked increase of the cocci in the lens remains; their prolific production cannot be checked by the aqueous nor by the phagocytosis of the leucocytes; on the second day exudation into the anterior part of the vitreous takes place, followed a day or two later by purulent retinitis and choroiditis and developing into panophthalmitis on the seventh day.

In cases where the posterior lens capsule had been torn, a very remarkable difference was observed between the behaviour of injected ink and cocci: the ink traverses the vitreous and enters the tissue of optic disc and nerve,

while the cocci do *not* enter it. When they approach the optic disc towards the funnel-shaped apex of the lamellæ of the vitreous, they are met by a mass of leucocytes, which migrate from the optic nerve and form a sort of protecting shield for the optic disc.

Andogsky finds in this circumstance an explanation of the observation that panophthalmitis after extraction of the lens is scarcely ever followed by meningitis. He does not doubt the correctness of Deutschmann's observations on the development of sympathetic ophthalmitis, and his own experiments show that if the inoculation takes place into the *posterior* part of the vitreous, the cocci enter the lymphatic spaces of the optic nerve.

It is further interesting to watch small inoculations of cocci into the anterior chamber of eyes in which extraction of cataract has been made with complete removal of lens matter. In these cases, only a slight exudative iritis results, whether the posterior capsule of the lens has been torn or not. If the quantity of the cocci injected is more considerable, it depends on the state of the posterior capsule whether panophthalmitis will follow or not.

In conclusion, the author very cautiously remarks that his experiments, as they have been made on the eye of the rabbit, need not necessarily hold good to the same extent for the eye of man and other animals.

K. G.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

E. Nettleship, F.R.C.S., President, in the Chair.

Friday, July 3, 1896.

Experimental Research on the Course of the Optic Nerve Fibres.— This paper was communicated by Dr. C. H. Usher and Dr. Geo. Dean. The method employed was that of wounding the retina and tracing the degeneration in the nerve fibres by means of Marchi's osmium bichromate method.

The wounds were made with a Graefe's knife or galvano-cautery, the ophthalmoscope being used to enable the operator to produce the lesion in the part of the retina chosen. The first part of the communication dealt with the results obtained in a number of rabbits. As seen by the ophthalmoscope the wounds in the fundus resulted in the formation of a white elongated gap with sharply defined edges. Its length varied from about three-quarters to one and a-half diameters of the optic disc. Among the lesions were included division of the anterior and posterior bands of opaque nerve fibres. In all the cases a tract of degeneration was found in the nerve corresponding to the wounded retina. The degeneration occupied a situation in the nerve corresponding to the part wounded, for example, a lesion in one quadrant of the retina caused a degeneration in the corresponding quadrant of the nerve. The degeneration maintained the same situation throughout the whole length of the nerve. In the cases where the opaque bands were incised the degeneration was found to be denser than in the cases where other parts of the retina were wounded. In every case minute black points were found in the optic nerve of the eye, which had not been wounded. These points were diffusely scattered, and much less prominent than those on the side of the lesion ; they were found to stand in direct ratio to the amount of degeneration in the nerve of the eye operated on. The second part of the communication consisted of results obtained in the case of a monkey, in which a lesion, by means of the galvano-cautery, was made between the optic disc and the yellow spot. A well-defined area of degeneration was found in the corresponding optic nerve. It lay externally in the anterior part of the nerve, whereas it occupied a central position in the posterior part of the nerve. Its shape in the anterior part of the nerve was that of a narrow isosceles triangle, with its base at the periphery and its apex towards the central vessels. Behind the entrance of the retinal vessels the area gradually became central ; in this situation it assumed a somewhat irregular form with angular projections ; near the chiasma it was still in the

centre of the nerve, and crescent-shaped. In the other optic nerve small black points were present similar to those found in the case of the rabbits. The interest of this case in relation to cases of toxic amblyopia and in relation to the course and origin of the macular fibres was indicated.

Mr. C. D. Marshall said that the results of Marchi's method of staining nerve were not always reliable; black dots were to be found in nerves which were not degenerated. But they readily followed lesions of nerves, and were valuable as a sign of degeneration after lesion.

Congenital Hydrophthalmos.—This paper was read by Mr. F. R. Cross. Enlargements of the eyeball of this nature depend on an increase of the intraocular tension during youth from whatever cause, with consequent expansion of the corneo-scleral envelope and other ocular tissues. Hydrophthalmos in the young is equivalent to glaucoma in the old. Many of the cases of so-called buphthalmos are but a later stage of staphyloma in childhood; one true form of secondary glaucoma in children results from complete occlusion of the pupil, with bulging of the iris and blocking of the filtration angle. The closure or compression of the filtration angle appears to be the important element in nearly all cases of glaucoma. One of the reasons urged against this theory is the presence of the deep anterior chamber in hydrophthalmos, and the apparent wide separation between the cornea and iris. Careful microscopic examination of sections of hydrophthalmic eyes, however, shows that although the anterior chamber is deep, either the iris is adherent at its base to the cornea, or strands of tissue are present there blocking up the angle, and indicating a previous adhesion which had broken down. Other theories had been propounded to account for this condition, but they were not sufficient alone, or the data on which they were founded could not be verified by subsequent observers. Thus it was shown by an examination of one hydrophthalmic eye by Dürr and Schlegtendal that the vortex veins of the choroid were distended; but an examination of the author's specimens

showed a tendency to atrophy of the choroid, not to its cystic degeneration or to distension of its veins.

Mr. Treacher Collins said that in the cases of buphthalmos which did not follow any known antecedent disease, the symptoms always dated from birth, and that, therefore, they must look for some congenital malformation as the original cause of the changes which ensued. He showed that sometimes the iris failed to become completely separated from the posterior surface of the cornea, and that a congenital anterior synechia resulted. If such an adhesion existed at the periphery of the anterior chamber, it would tend to obstruct the exit of fluids through the filtration angle. In several specimens of buphthalmic eyes which he had examined, he had found an adhesion of the root of the iris to the cornea. In some cases of buphthalmos the tension became normal, and the progress of the disease was arrested; he suggested that in them the enlargement of the globe and the dilatation of the anterior chamber caused the adhesion of the iris to become stretched, and sometimes to give way.

Mr. Priestley Smith thought the specimens showed undoubted obstruction of the filtration angle; the evidence to his mind was quite convincing that the increased tension was due to closure of the angle of the anterior chamber. He had lately visited a blind school where he found six children out of 125, or about 5 per cent., blind from congenital hydrophthalmos. He preferred the use of the term congenital glaucoma, as these cases undoubtedly belonged to the same group as glaucoma in the adult.

Tension in Cases of Intraocular Growth.—This paper was read by Mr. C. Devereux Marshall. With a view of further elucidating the causes of glaucoma in cases of intraocular new growths, 100 cases had been examined, including (A) 53 in which the choroid only was affected; (B) 28 in which the ciliary body or iris was involved; and (C) 19 in which a glioma of the retina existed. Series A: In the first group the intraocular tension was as follows: (1) increased tension in 36, or 67·92 per cent.; (2) normal tension in 16,

or 30·18 per cent.; (3)? diminished tension in 1, or 1·88 per cent. Microscopically, it was found that in 27 cases out of the 36 in which the tension was increased the angle of the anterior chamber was closed. In 7 the angle was restricted, and in 2 its condition was not noted. Of the 16 cases in which the tension was normal, the angle was found open in 14, and in 2 cases the condition was not stated. There was no case in which the tension was undoubtedly less than normal, 1 was noted as (?), and in this case the angle was open. Series B: In this group in which the ciliary body was affected, the following conditions of tension existed: (1) increased tension in 10, or 35·71 per cent.; (2) normal tension in 14, or 50 per cent.; (3) diminished tension in 4, or 14·28 per cent. Of the 10 cases in which the tension was increased, the angle of the anterior chamber was closed in 6. In 2 it was much narrowed, and in 1 case it was open. Of the 14 in which the tension was normal, the angle was open in 10; in 1 it was narrowed; in 2 it was closed; and in 1 the condition was not stated. Of the 4 cases in which the tension was below normal, the angle was open in 2; in 1 it was somewhat narrowed, with a shallow anterior chamber; and in 1 the angle was closed on one side and doubtful on the other, but the ciliary body was to a great extent destroyed by the growth. Series C includes 19 cases of glioma of the retina, and the condition of the tension was as follows: (1) increased tension in 7; or 36·84 per cent.; (2) normal tension in 10, or 52·63 per cent.; (3) diminished tension in 2, or 10·52 per cent. Of the 7 cases in which the tension was increased, the angle was closed in 3, narrowed in 2, open in 1, and in 1 the condition was not stated. Of the 10 cases in which the tension was normal, the angle was open in 7 and narrowed in 1. In 1 the globe was nearly full of growth and there was no anterior chamber, and in 1 the condition of the angle was not noted. Of the 2 cases in which the tension was diminished, the angle was open in 1, and in the other perforation had taken place and the globe was shrinking. The vast majority of these cases prove the rule that the intraocular

tumour has a direct bearing on the condition of the angle of the anterior chamber, and also that it is by no means uncommon to have normal or even diminished tension in eyes containing new growths. There are one or two exceptional cases, in which the tension is increased when the angle is open, and normal or diminished when the angle is closed, but these are all complicated by a gross affection of the ciliary body, leading either to a considerable diminution of its normal functions, or else probably to the opening of secondary channels through which fluid can escape from the globe.

On the Employment of Electrolysis in the Treatment of Detached Retina.—This paper was read by Mr. Simeon Snell (Sheffield). He stated that the recent discussion at this Society indicated that the treatment of detached retina was still regarded as unsatisfactory. Occasional good results were doubtless obtained. A patient he operated upon many years ago by sclerotic puncture was, he understood, following his occupation, and was dependent upon that eye. He alluded to Terson's advocacy of electrolysis in detached retina. Mr. Snell had employed it in three instances. The first in a hopeless case, simply to test the method, but the detachment was reduced; the second in a patient who had extensive detachment; in this instance the result of the operation was distinctly encouraging, the detachment being diminished, the field increased and the vision considerably improved; and the third resulted in a practical disappearance of the detachment, a much enlarged field, and also improvement of vision from fingers indistinctly to $\frac{15}{100}$. It was too early as yet to state the final result. Mr. Snell thought the method was worthy of trial.

Card Specimens.—Mr. Adams Frost: Pulsating Exophthalmos undergoing Spontaneous Cure.—Mr. Hartridge: Slight Buphthalmos and deep Cupping and raised T. in a girl aged 9. Mr. Kenneth Campbell: Infecting Chancre of Eyelid.—Mr. Priestley Smith: Scheme for the Examination of Ophthalmic Cases.—Mr. Lang: Double Optic Neuritis.

THE FORMATION OF ARTIFICIAL PUPIL BY EXTRA-OCULAR IRIDOTOMY.[1]

By J. B. Lawford, F.R.C.S.

The operation known as *extra-ocular iridotomy* or *præ-corneal iridotomy*, was, I believe, introduced by Professor Schœler, of Berlin, by whom it was described in 1886.[2] In Schœler's first paper there is an interesting historical account of the various methods employed for the production of an artificial pupil. In 1711 Woolhouse advised the making of an artificial pupil for the improvement of vision, and his suggestion was first carried out by Cheselden in 1728. The procedure then adopted was to introduce a cutting needle through the sclerotic, perforate the iris from behind, and divide it by a transverse incision. Other methods of performing *iridotomy* were subsequently adopted, and in 1796 *iridectomy* (removal of a portion of the iris) was advocated by Beer.

In 1887 and 1888 Schœler recorded his further experience of extra-ocular iridotomy, publishing accounts of the additional cases in which he had employed it.[3]

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[1] A paper read before the Section of Ophthalmology, British Medical Association, Carlisle, 1896.

[2] Schœler, "Zur Optischen Pupillenbildung," *Berlin klin. Wochenschr.*, 1886, No. 46.

[3] Schœler, *Berlin klin. Wochenschr.*, October 31, 1887, and October 1, 1888.

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I have performed this operation at intervals since 1891, and I venture now to bring a communication on the subject before this section of the British Medical Association. My reasons for so doing are, in addition to the merits of the procedure, to which I shall presently draw attention, that I have never found it described in the text-books or medical journals to which I have had access,[1] and that but few of the surgeons to whom I have spoken on the subject have been cognisant of the operation, and a still smaller number have given it a trial.

In my opinion extra-ocular iridotomy is a valuable surgical procedure in suitable cases. The number of such cases is comparatively small. In my own practice at St. Thomas's Hospital and Moorfields Hospital, during the last five years, I have met with eight patients (nine eyes), for whom I considered this operation advisable, and who consented to undergo operative treatment. A few (perhaps three) others presented themselves, but declined the treatment recommended. As will be seen by reference to the table I have had prepared, my judgment was at fault in one instance, and no benefit to sight accrued from the operation.

The aim of this, as of all the various methods recommended for the formation of artificial pupil, is to produce a gap in the iris, in a position best adapted for the improvement of vision; the gap to be so fashioned in shape and size as to give the best possible optical results. Schœler claims for his procedure that it fulfils these conditions as well as any other method, and better than many of those hitherto employed.

Extra-ocular iridotomy is applicable to—(1) Cases of opacity of the cornea involving the central area, but leaving the whole, or some portion of the periphery

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[1] I can find no published report since Schœler's paper in 1888.

clear ; (2) Cases in which there is stationary partial opacity of the lens, either a small nuclear sharply defined opacity, or an anterior polar cataract the base of which is as wide, or nearly as wide, as the pupil ; (3) Cases (much less common) in which there is, as a result of disease or as a congenital defect, obstruction of the pupil by deposit on the anterior lens capsule, the pupillary margin of the iris being free. The operation is performed as follows :—An incision is made in the cornea close to, but not at the sclero-corneal junction ; the incision should be small (say about 5 to 6 mm.), as prolapse of iris is then less likely to occur, and yet not too small to interfere with the subsequent steps of the operation. I prefer to use a triangular keratome, but probably the exact pattern of knife used is not of much importance, provided a smooth regular incision is made. The knife is slowly and carefully withdrawn, so that the iris may not follow it through the wound. The blades of a pair of *fine* curved iris forceps are then introduced through the incision, and the iris gently grasped close to the pupillary border and withdrawn. The forceps which I have found most suitable have no teeth at the points, but the opposing surfaces of the blades are slightly roughened, or finely milled.

The protruding portion of iris is then picked up with the forceps with great care and delicacy, and divided by a pair of iris scissors. The cut should be at right angles to the pupillary margin, and should extend through about half the width of the iris, and should be made with the least possible disturbance and bruising of the iris. It is essential that the scissors should be sharp ; one snip should be sufficient.

The next step is to replace the protruding portion of iris ; this is done by tucking it back through the corneal wound by means of a soft silver spatula or repositor, or one made of vulcanite or tortoiseshell

—I prefer the metal instrument, as it can be boiled before use.

I need hardly add that great care should be taken in replacing the iris, in order that no portion of it should remain entangled in the corneal wound. This step practically completes the operation, and after careful cleansing, the eye is bound up with a pad and bandage. A few drops of a $\frac{1}{2}$ or 1 per cent. solution of physostigmine may be instilled before applying the bandage.

The patient should be kept quite quiet for the first twenty-four hours.

As a rule no reaction follows the operation ; the corneal wound closes rapidly, and the eye appears free from any disturbance in the course of a few days.

I ought, perhaps, to emphasise the fact that an operation such as this form of iridotomy should be guarded by the strictest precautions against septic infection. This is even more important in this than in many other operations upon the eye, inasmuch as a portion of tissue, after exposure to outside influences, is returned within the eyeball.

With careful aseptic measures, the risk of infection of the iris may be reduced to a minimum, and I have so far had no untoward experience in this respect.

I need not, at the present time, enter into details of the means employed to ensure asepsis.

In adults cocain anæsthesia is generally sufficient; in children, or in older patients without good self-control, a general anæsthetic should be administered. It is very important that the patient should be perfectly quiet during the operation. If cocain is used, it is, I think, a point of practical importance to operate before the drug has produced much mydriasis, and while the iris is still free and flaccid.

The position in which the coloboma is to be placed

will necessarily vary with the conditions for which the operation is undertaken. If the corresponding portion of the cornea is clear, Schœler recommends that the iris should be divided at the nasal end of the horizontal meridian. In the cases now recorded I have made the gap in the lower nasal quadrant; in one case I attempted unsuccessfully to divide the iris in the lower temporal part, corresponding to the only portion of clear cornea.

The performance of this operation is not really difficult, although it is a proceeding which must be carried out with care and delicacy. The chief difficulty I have experienced has been in withdrawing the iris. I have avoided the use of toothed forceps in my desire not to subject the iris to any unnecessary bruising; the toothless forceps are, however, apt to slip after the iris has been grasped.

In reference to this point it might well be suggested that allowing, or trying to induce a prolapse of the iris, when withdrawing the knife, would be a distinct advantage. In Schœler's first paper he speaks of the prolapse of iris through the corneal incision as though it were a regular and desirable occurrence. In his later papers, however, he describes the withdrawal of the iris by forceps. The latter method is, I think, preferable; the surgeon is able to withdraw a small portion of the iris, and to be sure that the cut in the iris is at that part most suitable for the artificial pupil. It must be allowed, however, that the protrusion of the iris by the outflow of aqueous, is less likely to lead to bruising of its tissue than when it is withdrawn by forceps.

I have twice failed to accomplish the operation—once on account of the difficulty mentioned, and once from failure to divide the iris at its pupillary border (which was necessary in that case). In both instances

I did an iridectomy instead, in the first instance at the same sitting, and in the second a few days later. In one case the iris remained adherent to the corneal scar at one point, and a second operation was necessary to free this synechia.

Extra-ocular iridotomy, when well performed, produces, I think, an almost ideal artificial pupil for visual purposes. The gap in the iris is small, wedge-shaped, with the narrow end towards the periphery, and includes only the pupillary half or two-thirds of the iris.[1]

Herein lies its superiority to iridectomy for visual purposes, for by no method, that I am aware of, can such a narrow well-shaped coloboma be obtained by iridectomy. Its advantage over intra-ocular iridotomy consists in its greater safety. The risk of wounding the lens during the performance of intra-ocular iridotomy is, even in the most skilful hands, a very serious one, and fear of the accident has hitherto deterred me from trying it. In this operation we are now considering there is no such danger. The only serious accident likely to occur is that of septic iritis ; and against sepsis we can guard the eye almost certainly.

I have here a tabular statement of the cases, nine in all, in which I have performed extra-ocular iridotomy. In four eyes there was corneal opacity, and in the remaining five lenticular opacity. For the compilation of this table and for further help in examining patients and noting results, I am indebted to my colleague, Mr. J. Herbert Fisher.

Instead of the tabular statement, the following brief notes, condensed from it are given.

Case 1.—Male, aged 14. L. corneal nebula. V. before

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[1] The sketches, which I hand round, show the shape and size of the artificial pupil in seven of the eyes operated upon. Of these Nos. 1 and 2 are not good examples ; in the others the gap in the iris is small and wedge-shaped.

operation, L.—16 D. $\frac{6}{36}$, 1 J. at 10 cm.; three years after operation—16 D. = $\frac{6}{36}$ 1 J. fluently.

Case 2.—Male, aged 10. R. corneal opacity. V. before operation, spells 10 J.; six months after operation, V. = $\frac{6}{24}$ partly, spells 2 J.

Case 3.—Male, aged 12. Lamellar cataracts. V.R. before operation, $\frac{6}{36}$—4 D. $\frac{6}{18}$, 1 J. at 22 cm.; a year and a half after operation, V. = $\frac{6}{18}$ partly, unaided, 1 J. well.

Case 4.—Male, aged 31. Nuclear cataracts. R.V. before operation, $\frac{6}{24}$; four years after operation, V. = $\frac{6}{12}$ 4 letters, and reads 1 J. well.

Case 5.—Same patient. L. eye: V. before operation, $\frac{6}{18}$ partly, and J. 15; three years and a half after operation, V. = $\frac{6}{12}$ partly, 1 J. well.

Case 6.—Male, aged 30. R. congenital cataract (L. excised). V. before operation, $\frac{6}{60}$; two years after operation, $\frac{6}{18}$ partly, reads 6 J. easily.

Case 7.—Female, aged 6. Lamellar cataract No improvement in vision.

Case 8.—Female, aged 8. Attempted iridotomy unsuccessful.

Case 9.—Male, aged 51. Attempted iridotomy unsuccessful.

A. ALT (St. Louis, Mo.) **Observations concerning the Endothelial Lining of the Anterior Chamber in Health and Disease.** *American Journal of Ophthalmology, February to July*, 1896.

These papers report the results of a prolonged series of investigations concerning the endothelium of the anterior chamber, viz., that of Descemet's membrane, the ligamentum pectinatum and the iris. This is a field which, it seems to the author, has thus far been treated rather slightingly, important as it is for the full understanding of

many pathological conditions seen clinically. The subject is illustrated with numerous micro-photographic reproductions.

The endothelial lining of Descemet's membrane was studied in a great many hardened human eyes by removing a part of that membrane from the corneal tissue by a section including as little corneal tissue as possible. This was found to be a better method than to tear Descemet's membrane off, as is usually done. The transverse sections of the membrane are not calculated to teach much.

The endothelial lining of Descemet's membrane undoubtedly consists of a single layer of flat polygonal cells, with a round or oval nucleus. The more or less regularly hexagonal form of the cells, as often mentioned, and drawn from animals' eyes, is, however, but rarely found. To this general description of previous writers, Alt has to add that the shape and arrangement of the cells vary considerably with the age of the individual. In the eye of the newly born the nucleus is large and the cell-protoplasm very insignificant in quantity, so that the nuclei are close together. With increasing age, the nuclei do not seem to grow smaller, yet the cell-protoplasm increases materially in quantity, and an irregular arrangement of the nuclei results. Some lie close to each other, others a very considerable distance from each other. In the adult eye the cells are considerably larger and the nuclei further apart, near the centre of the cornea. Near the periphery, and just in front of where the ligamentum pectinatum begins, they are usually much smaller, and consequently more numerous, and their nuclei lie much closer to each other, although not so close as in the eye of the newly born.

The above conditions are those in which the endothelial cells may be considered as being at rest. Alt has found these less frequently than the conditions that Waldeyer regarded as exceptional. The restless or active condition of the endothelial cells seems rather to be the normal. The simplest variation from the condition of rest is one in which each cell is surrounded or outlined by a shining

line, separating it from the neighbouring ones. This corresponds to the black line produced by impregnation with nitrate of silver, and appears like the clear lines dividing the individual cells of the pigment epithelium layer of the retina. He thinks it is the initial stage of the changes about to be described.

What Waldeyer saw exceptionally in specimens stained with hæmatoxylin, is the arrangement of the endothelial cells most frequently seen—that is, the retraction of the cells from each other, leaving open spaces between them. The variety of shapes which the cells adopt during this condition of unrest, by the contraction of the cell-protoplasm around the nucleus, away from the neighbouring cells, leaving only small, thread-like connecting fibres, is simply indescribable. In some cases a certain degree of regularity seems to obtain in the manner of this contraction of the cell-protoplasm. In others (frequently seen in all sorts of eyes) the cells and their nuclei take on the most grotesque shapes. The apertures between the cells, which result from the contraction of the cell-protoplasm, are mostly round, sometimes oval, but they vary in size to a very considerable extent.

That this condition is one of cell-activity is shown by the fact that all of the nuclei show karyokinetic figures, and very frequently nucleolar and cell-division can be found. Alt has found these conditions in apparently normal eyes, but particularly in pathological ones, in which, however, during life, the anterior part of the eye-ball had appeared perfectly normal, and they were present almost without exception in eyes with pathological conditions affecting the anterior part of the eye. When there is a foreign substance, as an exudation in the anterior chamber, its very presence often stimulates the endothelial cells to rapid division, so that soon clusters of round, vesicular cells are seen to form on the original layer and protrude into the anterior chamber.

As is well known, vitreous warts (Hassal) are very frequently found to lie between the endothelial cells in the periphery of Descemet's membrane. These warts are by

many considered to be characteristic of adults or old age. This is, however, not absolutely the case, as Alt has seen them in several eyes of young children. In trying to learn the mode of their origin he has become convinced that they are results of a degenerative metamorphosis of the endothelial cells themselves, and that each wart corresponds to such a changed cell. The process seems to be that at first the cell loses its vitality. Instead of being able to contract its cell-protoplasm like the neighbouring cells, it appears rounded off, and gradually its nucleus takes up less stain, until finally such a cell may at one time appear as a roundish, barely-stained, amorphous mass lying between the surrounding cells. Gradually this amorphous mass becomes more and more homogeneous, and forms the so-called vitreous wart. In so far the process corresponds exactly to the one seen in the pigment epithelium, where the warts are usually described as colloid excrescences.

From this it appears that we have in the endothelium of Descemet's membrane not, as the prevailing idea seems to be, a tissue that undergoes but little change during life, but, on the contrary, a membrane in the cellular elements of which activity is rather the rule.

Apart from the forms of proliferation already mentioned, Alt has frequently found the endothelial cells in the neighbourhood of corneal wounds or ulcerative processes taking on an elongated shape and becoming gradually more and more spindle-shaped. This seems to point to the possibility of a new formation of connective tissue from these cells. In a number of instances Alt has seen the cells of Descemet's endothelium pass into a new-formed, distinctly but irregularly lamellated tissue, lying to the inner side of this membrane. This is particularly found in connection with anterior synechiæ of different tissues. From what we know concerning the healing of a small wound in the lens-capsule, and from his own observations, Alt thinks that Descemet's endothelium can not only form lamellated connective tissue, similar to the corneal tissue, but that it can form, and perhaps does originally form, the vitreous membrane which we call that of Descemet.

Alt has never seen any specimen which would show, or even tend to show, that pus cells ever do or can pass through Descemet's membrane into the anterior chamber; their only way lies through the meshes of the ligamentum pectinatum.

The Ligamentum Pectinatum and its Endothelium.

Alt thinks there is no doubt that Descemet's membrane, at its periphery, splits up into the fibres which form the ligamentum pectinatum. Attached to these fibres are a large number of flat endothelial cells, situated especially at the angles made where the fibres join each other.

With reference to Schlemm's canal, Alt now says, in correction of his former statement, that he has in a number of cases seen blood contained in the canal, although we generally find it empty after death. It evidently can, with propriety, be compared to the meningeal sinuses. It is lined with a single layer of flat endothelial cells. He has frequently seen, in meridional sections of these parts, short, widely-open passages passing from the reticular tissue into Schlemm's sinus, so often that their occurrence cannot be looked upon as accidental. Sometimes there are several in one section. Observations like this cannot leave any doubt as to the existence of open canals which lead from the reticular tissue into Schlemm's sinus. Yet, as Alt has frequently seen large amounts of pigment and cellular *débris* carried through the meshes of the reticular tissue into Schlemm's sinus, he does not think that we can consider the process one of simple filtration.

When the fluids passing from the anterior chamber through this reticular tissue into Schlemm's sinus contain larger quantities of cells (pigmented or unpigmented) and cellular *débris*, these solids are held within the meshes, and soon, new ones being added, they choke the interstices and openings between the fibres. When this choked-up condition cannot be relieved by the current of the fluids, it leads to a process of condensation or solidification of the meshwork. Thus after some time we find the layers of fibres

glued to each other and the reticular tissue, which projected inwards to some extent in its sweep towards the root of the iris, is now changed to a solid tissue, little differing from the corneo-scleral tissue, and no longer projecting inwards. All this may occur while Schlemm's sinus has remained patent and apparently unaltered. Later on, however, it also is, as a rule, found to be obliterated.

This consolidation of the reticular tissue alone must of a necessity bring the root of the iris closer to the corneo-scleral tissue. And we may frequently see in such cases that the root of the iris is pressed against the region of the former ligamentum pectinatum. Alt has been unable to decide whether this consolidation of the meshes of the reticular tissue and the agglutination of its layers is due to proliferation of the endothelial cells of the ligamentum pectinatum or not. From his specimens, he thinks it apparent that the obliteration of the iris angle is, in some cases, certainly not due to pressure from behind alone, but to a new formation of tissue in the iris angle which, when contracting, pulls the iris periphery towards the corneo-scleral tissue, and, when it shrinks further, leads to more or less firm union between the iris and the corneo-scleral tissue.

The Endothelium covering the Anterior Surface of the Iris.

The endothelial cells covering the anterior surface of the iris can only be properly seen in the sections of this surface. They cannot be scraped off in larger masses, except from a diseased iris when a new formation of this tissue has taken place. By making many efforts in this direction, Alt succeeded in getting a large number of good surface sections of the iris, which show that the endothelial cells do not form a distinct membrane as they do on Descemet's membrane. The cells, on the contrary, are irregularly distributed over the uneven surface of the iris, but may be traced into all its wrinkles and crypts. The individual cells vary very much in shape. They are flat, mostly round, or somewhat branched, and have a round

nucleus. As a rule they do not take up staining materials as well as the other cells of the iris surface, which are, moreover, naturally pigmented cells.

The most conspicuous pathological change observed in the anterior surface of the iris was a newly-formed connective tissue, covered towards the anterior chamber with a terminal layer of endothelial cells. It is particularly in eyes which have undergone considerable hæmorrhages and in glaucomatous eyes where we meet with this new formation. He is unable to say whether this new tissue is altogether due to proliferation of the anterior endothelium of the iris, but thinks there is no doubt that it is, in great measure at least, the result of such a proliferation. When an occlusion of the pupil has taken place, and a pupillary membrane has been formed long enough before the removal of the eye, a smaller or larger quantity of such newly-formed connective tissue can always be demonstrated. If nowhere else, it is always found near to and at the pupillary edge. The newly-formed tissue, however, is by no means an invariable consequence of iritis. It seems that certain forms of stimulation are necessary to lead to such a proliferation of the endothelium on the anterior surface of the iris.

E. J.

FUKALA (Vienna). The Cure of High Myopia. *F. Denticke, Leipzig and Vienna, pp.* 189. 1896.

This monograph consists of two parts; the first, which includes rather more than half the volume, concerns the "operative treatment of high grade myopia by discission and extraction of the lens"; the second deals with the estimation of the axial measurement of the globe, the optic constants, and the size of the retinal images.

The opinions and practice of the author, in reference to the operative treatment of highly myopic eyes, are well known from his numerous writings on the subject during

the last fifteen years (*see* OPHTHALMIC REVIEW, 1890 and 1895).

In the volume before us he begins by discussing the disabilities of patients afflicted with high myopia, and the difficulty and often impossibility of improving vision by glasses, which can be tolerated sufficiently to enable them to earn their livelihood.

A brief account of the operative measures formerly proposed and practised, includes the statement that the suggestion to remove the lens from highly myopic eyes was first made by G. A. Richter in 1790.[1]

At the Ophthalmological Congress in Heidelberg in 1858, Mooren brought the question forward again, and recommended the extraction of the transparent lens in high myopia. His views were strongly opposed by v. Graefe and others, and this method of treatment was shelved for a time. In the last fifteen or sixteen years it has been systematically employed by many surgeons, and Fukala states that published records of over 1,000 cases are now available.

The results of operations collected or referred to by the writer are very encouraging; the technique to adopt, the age-limit for operation, and the degree of myopia which renders such treatment expedient, are all discussed in this treatise. Fukala is in favour of discission and subsequent removal of the lens, and for the majority of cases deprecates immediate extraction.

The accidents to which eyes thus treated are liable, either at or subsequently to the operation, appear to occur in a very small percentage of cases, judging from the published records. The most serious is detachment of the retina.

The second part of the volume cannot be dealt with in a brief notice.

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[1] In a paper read before the Société Française d'Ophtalmologie in May, 1896, Vacher adduces evidence that some years previously a French Abbé, Desmonceaux, advised extraction of the lens in myopia of two to three inches in young subjects. Desmonceaux's work was published in Paris in 1776.—*Annales d'Oculistique*, July, 1896, pp. 6 and 7.

The book is worthy of perusal by those interested in the subject with which it deals, and gives a fairly comprehensive account of the knowledge and experience of the operative treatment of myopia as practised in late years. A list of references to the literature of the subject at the end of the book is less complete and less accurate than is desirable.

J. EYRE. On the Xerosis Bacillus. *The Journal of Pathology and Bacteriology, July*, 1896.

During the investigation of a series of cases of follicular conjunctivitis with some unusual features, the author isolated the xerosis bacillus of Neisser. This bacillus, closely resembling the diphtheria bacillus in many of its characters, was found by Kuschbert and Neisser to be abundantly present in the condition known as xerosis conjunctivæ; their observations have been confirmed by subsequent investigators. The bacillus has also been found in cases of trachoma, chalazion, and, in other situations than the eye, in ulcers of skin, soft chancre, &c. Fraenkel and Uhthoff assert that it is frequently present in the conjunctival secretion of healthy eyes; Franker states that he could not find it in 120 examinations of healthy conjunctival secretion.

Eyre was able to isolate this organism in twelve cases of conjunctivitis, characterised by the presence of a number of small, irregularly oval, pinkish œdematous bodies, in the lower fornix, not encroaching on the ocular conjunctiva. The symptoms complained of were lacrymation, photophobia, inability to do near work continuously, and distress in artificial light; there was some conjunctival injection.

Of the twelve cases, six were males, six females ; of the latter, two were classmates at school, four were members of one family. Among the males no such connection existed.

In ten cases the bacillus was obtained from the conjunctival secretion in pure culture ; in one, a white torula, nd in another staphylococcus pyogenes aureus was also present.

In twenty-five pairs of normal eyes, the author has failed to find the xerosis bacillus in the conjunctival secretion.

Eyre describes the micro-organism as a "non-motile, non-liquefying, facultative, anærobic, non-sporing bacillus." He gives a careful account of the biology and morphology of the microbe, and of his inoculation and other experiments with it, and concludes with the following

Differential Summary.—To differentiate the xerosis bacillus from the Klebs-Löffler bacillus, is, in the case of first cultures, easy ; the former does not grow on blood serum at 37°C. under thirty-eight to forty-eight hours ; the latter makes its appearance in eighteen to twenty-four hours.

With cultures fifteen to twenty generations old there is also little difficulty ; the xerosis bacillus is then a shorter, more slender, and more curved bacillus, exhibiting neither segmentation nor clubbing, both of which characters are well seen in the Klebs-Löffler bacillus.

In the intermediate stages, as in early sub-cultures from the first culture, the xerosis bacillus closely resembles, in its general characters and mode of growth, the Klebs-Löffler micro-organism, and to distinguish one from the other is no easy matter. The chief points to be relied upon, in addition to those already mentioned, are as follows :—

When grown in neutral bouillon or milk, the xerosis bacillus never gives rise to an acid re-action ; *bacillus diphtheriæ* invariably does so. When grown on potato, the xerosis bacillus degenerates and dies ; the diphtheria bacillus flourishes better than on any other medium.

In 10 per cent. gelatin, colonies of xerosis bacillus are

not visible to the naked eye under forty-eight hours; the colonies of *bacillus diphtheriæ* can be recognised in twelve to twenty-four hours.

Animals susceptible to the diphtheria bacillus are unaffected by inoculation with bouillon cultures of the xerosis bacillus.

The author is of opinion that it is impossible to decide at present as to the exact nature of the xerosis bacillus, and suggests that it may be a non-virulent and slightly altered species of the *bacillus diphtheriæ*, or a totally separate and distinct micro-organism.

J. B. L.

F. MAYO (Philadelphia). The Comparative Values of Homatropin and Atropin. *Medical News, June* 27, 1896.

ALTHOUGH the action of homatropin hydro-bromate upon the eye has been carefully studied since 1881, its reliability as a mydriatic is doubted by many ophthalmologists. To determine its value in this direction, Dr. Mayo tested the effects of the drug in 110 eyes in the following manner.

Homatropin was first used, and while the eyes were yet under the influence of this drug, atropin was instilled, thus producing a continuous mydriasis and allowing the atropin to act upon a ciliary muscle, which was already paralysed to as great a degree as homatropin was capable of producing.

The use of homatropin was not trusted to the patient, but the instillations were made by Dr. Mayo at the clinic. The strength of the solution was 1 gr. to 40 minims of water. Six drops of this were used at intervals of five

minutes, one hour before the test was made. The condition of the refraction was then measured by skiascopy and subjectively with the test case, and the same procedure was employed to ascertain whether any accommodation was present. The cases were selected only to the extent of excluding those patients who were not sufficiently intelligent to respond to the subjective tests. The ages of the patients ranged from 11 to 39 years.

As soon as the measurement of the refraction under homatropin was completed, the patient was given a solution of sulphate of atropin, $\frac{1}{2}$ gr. to fl. ʒi., with directions to use one drop in each eye three times daily, and to return to the clinic after a two days' use of the drops. The refraction was then examined a second time.

The refraction showed, in one eye, myopia; in three, myopic astigmatism; in four, mixed astigmatism; and in all the others hyperopia or hyperopic astigmatism. The homatropin and atropin used were from Merck's laboratory.

The conclusions reached are: that atropin confirmed the measurement made under homatropin in every case; that it failed to reveal any error of refraction which the homatropin had not already detected; and that if homatropin be properly used it may be relied on to paralyse the accommodation.

E. J.

AMERICAN OPHTHALMOLOGICAL SOCIETY.

Thirty-Second Annual Meeting, held at New London, Conn., 1896.

Dr. Geo. E. Harlan, President.

Orbital Tumours.—Dr. C. S. Bull, of New York, read a paper upon the course and prognosis of malignant orbital tumours, as influenced by surgical operations for their removal. The basis of the paper was a series of thirty-six cases encountered in private practice, including both primary and secondary growths. Three classes were recognised, the intraocular, those which had already penetrated the sclera or had arisen originally in the orbit, and those which arose from the walls of the orbit and the neighbouring cavities. It was pointed out that prior to enucleation it was impossible to determine with certainty that a growth starting within the eye-ball had not penetrated the sclera posteriorly, and if the sclera had been perforated there could be no certainty of complete removal. Tumours arising in the walls of the orbit or the neighbouring cavities were never capable of complete removal.

Dr. Bull's conclusions were: that for malignant new growths in the orbit the prognosis was always unfavourable: that except with some encapsuled tumours in the orbit, recurrence always takes place after removal, and after recurrence the progress of growth is more rapid; that repeated operations tend to shorten life; but that nevertheless after proper explanation of the probable outcome, it might be the surgeon's duty to operate for the relief of unbearable pain even if it did shorten life.

Dr. H. Knapp endorsed these conclusions, except that adenoma of the lacrymal gland might, he thought, be permanently eradicated.

Dr. Noyes had seen four cases of epithelial growth of the lids which, after removal, were followed by a sarcomatous growth in the orbit. After removal of the

secondary growth, there was recurrence and early death in two, but the other two had lived many years without recurrence.

Dr. Johnson and Dr. Gruening could confirm the general conclusions, but would except tumours of the optic nerve as not liable to recur. They had seen no recurrence, the former in fourteen years, and the latter in nineteen years after removal.

Dr. Bull had met no case of tumour of the optic nerve; he had included two of the lacrymal gland, one of which proved to be endothelial and had not recurred; the other was sarcomatous and did recur.

Intraocular Sarcoma.—Dr. S. D. Bisley, Philadelphia, exhibited the specimens and reported a case of melano-sarcoma originating in the ciliary body. The eye had been blind for two years, and the tumour noticed for a year and a half. There was no recurrence in six months.

Dr. S. B. St. John, Hartford, showed specimens and reported a case of a sarcoma of the iris, which had started a year previously as a black spot, and at the time of enucleation consisted of a mass filling one quadrant of the anterior chamber.

Dr. J. A. Andrews, New York, also exhibited specimens and reported a case of primary sarcoma of the choroid. He believed it possible to have a growth so confined to the iris that it could be completely removed by iridectomy; but it was impossible in any particular case to be sure of this, so that it was better for the patient's sake always to enucleate the eye.

Drs. Bull and Knapp regarded sarcoma as always malignant, and sure at some time to recur.

Dr. O. F. Wandsworth, Boston, had a case which he had reported to the Society, in which he had enucleated the eye for sarcoma twenty-two years ago, and the patient still remained in good health.

Dr. John Green, St. Louis, had enucleated for spindle-cell sarcoma in 1867, and the woman was still well.

Dr. E. Gruening, New York, had two patients doing

well, one four, the other twelve years after enucleation for sarcoma.

Dr. R. A. Reeve, Toronto, had a case in which recurrence took place after fifteen years. The second growth was removed, but the patient died of a fresh recurrence in two years. He also had a case which illustrated the fact that marked absorption of sub-retinal fluid under potassium iodide did not negative the diagnosis of a malignant growth from the choroid.

Dr. Wm. F. Norris had one patient who was still in good health fifteen years after the removal of the eye for spindle-cell sarcoma.

Dr. G. E. de Schweinitz called attention to the fact that growths which had been so long survived, were mostly, or always, of the spindle-cell variety.

Dr. W. F. Mittendorf's cases of sarcoma had all died in from two to five years.

Tumour of the Optic Nerve.—Dr. Risley reported a case, and showed the specimens of tumour of the optic nerve, occurring in a girl $3\frac{1}{2}$ years old. When seen there was swelling of the lids, great chemosis, stony hardness of the globe, and a yellowish mass in the vitreous. A diagnosis of retinal glioma was made ; but the symptoms improved so under treatment, that it was regarded as a case of pseudo-glioma. There had been no noticeable exophthalmos. On attempting enucleation it was found that a tumour extended back from the eyeball, filling the apex of the orbit and the posterior part of the globe. The optic nerve was divided well behind it.

Cancer of the Choroid.—Dr. H. D. Noyes, New York, reported two cases, with exhibition of specimens, one of a wide choroidal thickening beginning in the macular region, in a woman of 35, who had undergone operations for the removal of mammary and uterine cancers, and still had a lump in her breast. She had been examined for glasses in May, and nothing wrong in the fundus was detected. In July she had a choroidal tumour. In August it caused a central absolute scotoma, and later the retina

became detached. The growth being secondary could be dealt with more deliberately than it otherwise might, but the eye was removed because it became painful, and interfered with the use of the other eye.

He also reported a case of new growth beginning with cloudy vitreous hæmorrhage into the retina, and a black spot on the exterior of the globe. The eye was enucleated, and the patient after eight years remained in good health.

Osteo-Sarcoma of the Brow and Skull.—Dr. H. Knapp, New York, reported a case occurring in a man aged 36, who had influenza twenty months previously, and sixteen months later suffered from headache and drowsiness. Two months after that there appeared a swelling of the outer half of the right brow, and subsequently there was a spontaneous fracture of the femur. The swelling and mental dulness and headache increased until death. The autopsy showed that the tumour of the brow extended into the orbit, and thence through the orbital fissure into the middle cerebral fossa. The consistence of the growth was that of soft bone, cutting readily with a chisel. There was also another growth of the same kind in the posterior fossa. The microscope showed the structure to be that of a large round-cell sarcoma.

Exostosis and Hyperostosis of the Orbit.—Dr. R. Sattler, Cincinnati, reported a case of ivory exostosis of the orbit, and presented the specimen. It occurred at the upper inner angle of the left orbit, in a man aged 25, causing exophthalmos, increasing slowly at first, and more rapidly later. It had been noticed for three years. Firm pressure upon it caused syncope. The eye possessed full vision. Exploratory incision showing its feasibility, the growth was removed by chiselling away the margin of extremely hard thickened bone around it. The operation opened both the frontal and ethmoidal sinuses, but was followed by good recovery. Dr. Sattler also reported a case of hyperostosis of the cranium involving the orbit.

Tuberculosis of the Conjunctiva.—Dr. F. E. Cheyney, Boston, reported a case in which the lesion, which was of the conjunctiva, was supposed to be primary, although there had been occasional cough since the child had suffered with measles four years before. There was a group of rather hard granules near the middle of the tarsal cartilage, which broke down later, giving rise to ulceration. The glands in front of the ear, and later those of the neck, were enlarged. There were no signs of pulmonary tuberculosis. The conjunctival lesion was dissected out, but the glands were not disturbed. This improved the local condition, but the throat became affected and the child died with tuberculosis of the right lung and mesentery.

Dr. Andrews exhibited a card specimen of a case of tuberculosis of the iris. At first there was no symptom pointing to tuberculosis of other parts of the body. But some weeks later intra-cranial disease manifested itself, and the patient died of meningitis.

Tumour at the Inner Canthus.—Dr. A. A. Hubbell, Buffalo, reported a case of congenital tumour arising from the region of the inner canthus, inner ends of the lid and caruncle. It had a dermal covering, was three-fourths of an inch in diameter, and was composed chiefly of compact adipose tissue, with a piece of bone three-fourths of an inch long, which passed into the pedicle and was attached posteriorly.

Blood Vessels of Retina and Choroid.—Dr. James Wallace, Philadelphia, reported a microscopical study of these vessels, illustrated by micro-photographs, in which he found the nerve fibres ending in loops in the walls of the vessels.

Apparatus for Measuring Accommodation.—Dr. Wallace also presented an apparatus carrying an accurately graded series of near-vision test type, and furnished with tape-measure, for the accurate determination of the near point of distinct vision, and the far point in myopia.

Diphtheritic Conjunctivitis.—Dr. Myles Standish, Boston, reported the results of bacteriological study of this disease,

which seemed to indicate that it was more general than was supposed, and that the common impression of its clinical characteristics would have to be revised, to make it cover the cases presenting Klebs-Löffler bacilli. He reported three cases. The first presented the clinical characteristics laid down in the descriptions of the books, going on to a fatal termination without the appearance of membrane in the nose or throat, and in which no Klebs-Löffler bacilli were found. The second was a case of a *croupous* membrane lining the conjunctiva of the lids, diphtheria of the larynx, and terminating in death—the membranes in both situations showing the bacilli. In the third case there were membranes, but no bacilli, and the child got well.

Keratitis Punctata Superficialis.—Dr. B. A. Randall, Philadelphia, reported a case in a lady without known malaria or other taint, characterised by punctate elevations of the central portion of the cornea with some more diffused opacity down and out. Transmitted light gave almost exactly the appearance of Decemititis, but the opacities could be proved to be wholly superficial. No abrasion had been present, nor was there any staining with fluorescin until late in the disease. It had been growing rather worse and now seemed to threaten ulceration. The considerable suffering had been generally relieved by a mydriatic and hot fomentations, and iodol ointment seemed to soothe; but other medication had been unsuccessful. The results were on the whole disappointing.

Persistent Pupillary Membrane.—Dr. Wm. F. Norris, Philadelphia, reported three cases of *membrana pupillaris preservans*, in which there was a firm attachment to the lens capsule with opacity of that membrane, and a thin layer of underlying lens substance. The report was accompanied with three water-colour sketches.

Irido-cyclitis.—Dr. B. L. Milliken, Cleveland, reported a case in which the left eye had been torn by a thorn, but recovered with some vision. After periods of depressed

health, the patient had suffered from attacks of inflammation of the iris and ciliary body, beginning at the point of injury and extending round the eye. The uninjured eye was also the seat of a similar attack, which, on account of the symmetrical distribution and course, suggested a sympathetic condition.

Traumatic Irido-choroiditis.—Dr. Chas. Kollock, Charleston, reported two cases in which the treatment of this condition by inunctions of mercury, had seemed to hold in abeyance for several months a process of sympathetic irritation and inflammation in the other eye, until the injured eye could be removed. After all wounds of the eye-ball a general mercurial treatment was recommended to prevent exudation.

Dr. Standish had seen two cases of complete recovery from sympathetic ophthalmitis with restoration of full vision, and both had occurred under mercurial treatment.

Choked Disc from Brain Disease.—Dr. H. F. Hansell, Philadelphia, reported a case that had been under observation for three years. The first symptom was headache following exposure to the sun. Under the use of mercury there was improvement. The swelling of the disc amounted at one time to 6 D. Later there was optic atrophy. The autopsy revealed a cystic tumour involving the right frontal lobe of the brain. The optic nerve sheaths were enormously distended.

Cerebellar Tumour.—Dr. C. A. Oliver, Philadelphia, reported a case with a history of previous traumatism and syphilis, in which there was choked disc and blindness. The autopsy showed a glio-sarcoma involving the cerebellar peduncle, and undergoing degeneration.

Sterilisation of Instruments.—Dr. S. Theobald, Baltimore, reported some bacteriological experiments bearing upon the sterilisation of the instruments used in cataract extraction. Since prolonged exposure to the temperature of boiling water proved injurious to delicate cutting instruments, he had tried washing them in boiling water,

and scrubbing them with absorbent cotton. After such a cleansing no growth of the ordinary pus organisms was obtained from the knives and the smooth instruments.

Dr. R. L. Randolph, Baltimore, read a paper upon *Absolute Alcohol as a Disinfectant* for ophthalmic instruments, his attention having been turned towards this agent because of its recognised value as a disinfectant for the hands. The anthrax spores did not furnish a proper criterion by which to judge of the practical value of a disinfectant, but on the other hand, no line could yet be drawn separating pyogenic from non-pyogenic organisms. He had tried inoculations of tubes of agar with instruments exposed fifteen to thirty minutes to absolute alcohol, obtaining five infections in one hundred tubes, and these might have been through air contamination. Of twenty-five tubes inoculated by instruments taken from the instrument case, without such precautions, eighteen were infected. Experiments with iron nails kept three days in contact with cultures of pyogenic organisms and, after exposure to absolute alcohol, used to inoculate tubes, gave, out of seventy tubes, but nine infections. He felt we were justified in placing confidence in absolute alcohol as a practical disinfectant for ophthalmic instruments.

Choroido-retinitis following Lightning Flash.—Dr. Oliver reported a case, illustrated by drawings and water-colour sketches, of the subjective appearances due to the fundus changes. The patient, who was an artist, had just had his eyes examined and on his way home was exposed to a very bright flash of lightning. Next day there was a spot in the centre of the field of the right eye and around it the appearance of a greyish mass in constant motion. The scotoma continued for several months with brilliant scintillating points showing at times. Objects could be seen imperfectly through it without distortion of form, but with marked diminution of size. There were relapses and returns of the scotoma, but in the end full vision was restored except for a barely perceptible scotoma seen against the sky. The left eye became affected after seven

or eight days, but never so much as the right. The ophthalmoscopic appearances were at first, a puffing and discoloration of the affected part of the retina. Five months later there was a sub-retinal hæmorrhage, and later, noticeable pigment changes.

Retinal Embolism. — Dr. O. F. Wadsworth, Boston, reported a case of embolism of the central artery of the retina, in which a retino-ciliary artery supplying the macular region caused preservation of central vision. The patient, a woman, aged 68, presented an irregularly contracted field, with the usual œdema of parts of the retina corresponding to the obliterated peripheral field. There were two retinal hæmorrhages, central vision was $\frac{20}{40}$. The retinal hæmorrhage disappeared after a few weeks. Dr. Wadsworth had previously reported a similar case.

Dr. W. F. Mittendorf had seen three cases in which complete blindness from embolism had been prevented. In two there were cilio-retinal arteries, which, however, did not supply the macula, and in one the escape of one branch of the central artery, which came off before the point of lodgment of the embolus accounted for the preservation of some sight.

Chronic Glaucoma.—Dr. Milliken reported a case of glaucoma in which a very large number of typical attacks occurred in the course of four years, sometimes coming on daily, without any permanent loss of vision or cupping of the disc, and with very slight permanent change in the field of vision. Only the right eye was affected, the left remaining healthy. The attacks, which had begun at the age of 49, were clearly provoked by any nervous stress; they were at last greatly benefited by iridectomy. Sclerotomy had been performed early in the case.

Angioid Streaks in the Retina.—Dr. Geo. E. de Schweinitz, Philadelphia, reported a case in which the gradual formation of these curious branching streaks of pigment deposit, following hæmorrhage, had been watched in the eyes of a healthy man of 47; his eyes were known to have been previously healthy. The report was illustrated by water-

colour drawings of the fundus changes at different stages. In this case there was no vascular disease or other ascertainable cause of the hæmorrhages. Careful and thorough examination of the blood had not detected any abnormality.

Retinal Changes in Pernicious Anæmia.—Dr. de Schweinitz reported a case of pernicious anæmia with the usual ophthalmoscopic changes, swelling of the disc, hæmorrhages and œdema of the retina; he presented microscopic slides and drawings illustrating the retinal lesions.

Symmetrical Retinal Changes, with General Weakness and Failure of the Central Nervous System.—Dr. Carl Koller, New York, reported two cases of this curious condition found in children of the same parents, marked by white patches of degeneration in the macular regions of the two eyes, with consequent blindness, arrest or retrogression of mental development, and general muscular weakness. The reported cases have occurred among the children of healthy parents, most or all eastern Jews. The cases all seem to terminate in death. Dr. Koller's patients were the second and fourth children, the first and third children being healthy. The older of the two was four years of age and could neither stand nor talk, although it had begun to do both at two years. The retina was atrophic, with a bluish haze in the region of the macula, and a cherry red spot at the fovea. The younger child was but a few months old, and in this case at least the retinal changes were not congenital.

Traumatic Rupture of a Retinal Vein.—Dr. Oliver reported a case of bruise of the eye-ball seen a few hours after the injury, which showed a rupture of the inferior temporal vein, from which the blood could be seen to escape and settle down into the part of the retina below it.

Cyst on the Optic Nerve-Head.—Dr. Risley reported a case of a translucent body situated in front of the optic disc, apparently a rounded cyst, not connected with some hyaloid remains which were present.

The Pupil in Absolute Blindness.—Dr. Harlan reported observations on three cases of absolute blindness from optic atrophy. The pupils in ordinary light were of about the usual size, or slightly dilated. Alternately covering and exposing the eyes produced no perceptible change in their size. On bandaging the eyes and keeping the patient in a dark room, the pupils after a few minutes were found dilated *ad maximum*. On exposure to diffuse daylight they contracted slowly and almost imperceptibly to their former size. On exposure to direct sunlight they contracted promptly and completely. The explanation seemed to be that the optic nerves, although unable to transmit to the higher centres an influence sufficient to awaken any sensation of light, were still able to transmit enough of a strong stimulus to excite the reflex-centres for contraction of the pupil.

Necrosis of the Skin of the Lids.—Dr. Kipp, Newark, N.J., reported the case of a man brought to the hospital for a fall during alcoholic delirium, covered with filth and vermin. He had chronic catarrhal conjunctivitis, with slight discharge. He was given chloral, and boric acid compresses were used for the eyes. Small dark areas appeared on the upper lids, below the brow, and gradually extended. The lower lids also became involved. After four days the whole skin of the lids came away, leaving the orbicularis muscle exposed. Three days later the man died. The condition was one of dry gangrene.

Blepharo-plasty.—Dr. Oliver reported a case of successful operation for restoration of the outer halves of both the upper and the lower lids, by a single flap taken from the forehead.

Location of Foreign Bodies in the Eye with Roentgen Rays.—Dr. Clark, Columbus, reported a case in which the presence of a small fragment of metal in the extreme angle of the anterior chamber and the iris, where it could not be seen, had been determined by radiography. The sensitive plate had been introduced into the adjoining nostril, the

patient being put under ether, and the rays directed upon it through the eye from the temporal side. He also suggested that the plate could be placed in the co-cainised conjunctival sac, or an opening could be made in the conjunctiva and the small plate slipped behind it. He believed that this method of locating a foreign body in the eye-ball was perfectly practicable, especially if the particle were lodged anteriorly, as in the ciliary region, where it could not be seen with the ophthalmoscope.

Dr. C. H. Williams, Boston, reported a case in which a fragment of the copper case of a cartridge had passed through the cornea and lens. Nothing could be seen of it, and it was not certain that it was in the eye. The use of the X-rays showed the presence of the fragment, and it was removed. The radiograph was obtained with ten minutes' exposure by laying the patient's head with the side of the injured eye upon the plate, and placing the Crookes' tube above and rather in front of the patient's head.

Hypopyon Keratitis.—Dr. John Green, St. Louis, for himself and Dr. Ewing, presented a series of microscopic slides obtained from an eye-ball, the seat of recent hypopyon keratitis, removed for orbital tumour. The slides showed the sources of the hypopyon to be a break in Descemet's membrane, exudation from the iris, and possibly exudation from Descemet's membrane itself.

Binocular Magnifier for Examination of the Eye by Oblique Illumination.—Dr. Edward Jackson, Philadelphia, referred to the lens described in the OPHTHALMIC REVIEW for May, 1896, and said he had found it an important help in getting a definite idea of diseased conditions of the cornea, iris and lens. This form of lens was satisfactory for practical work, and easy to use when one had learned to use it. But it was at first very difficult to employ it. On account of this difficulty he had worked out and presented a somewhat different means of accomplishing the same purpose. Two tubes converging to an angle of 40°, and long enough to make the space of 55 mm. between the centres of their divergent ends, were each furnished with a strong convex

lens at the converging ends; and at the end towards the observer with a twenty centred prism. These were so mounted that they would converge to a point slightly within the principal focus of the lenses. With this apparatus it was easy to demonstrate at the first trial the superiority of binocular vision for such examinations.

An Instrument for Determining the Axis of a Cylindrical Lens, either alone or in combination with a spherical lens, was presented by Dr. Williams. It made the determination by the direction of the focal lines obtained from a point of light.

Amblyopia in Reading.—Dr. Koller had noted that for reading ordinary newspaper print at the usual reading distance, full acuteness of vision was not necessary. Such print could be read by eyes with normal acuteness at about a metre, instead of one-third or one-fourth that distance. Taking advantage of this, and also of enlarged retinal images, it was possible to give very useful reading power to eyes that were partially amblyopic. The size of the retinal image depending on the relative distances of the first nodal point from the object, and the second nodal point from the retina, to get the largest retinal image he resorted to a strong convex lens placed some distance in front of the eye, and supported in a light spectacle frame to save its user the fatigue of holding it continuously in the hand.

The Treatment of Dermoids of the Orbit.—Dr. F. Buller, Montreal, called attention to the general agreement of recent text-books in recommending complete excision of such growths where practical, and their failure to give any suggestion for cases in which excision could not be done. In his first case he had undertaken complete excision; and the resulting damage to the pulley of the superior oblique muscle had caused a permanent diplopia. Subsequently he had followed the plan of incising the cyst, emptying it as completely as possible of its contents, cleansing it with a one-half per cent. solution of caustic soda, and placing

in the cavity a crystal of silver nitrate. The orifice was then kept freely open by packing with gauze, and the tract cleansed and dressed daily until it closed from the bottom. This method of treatment he recommended for dermoids of all kinds.

Dr. Matthewson, Brooklyn, after emptying the cyst had followed the plan of swabbing it out with absorbent cotton wrapped on a probe and dipped in a solution of silver nitrate, forty grains to the fluid ounce.

Dr. Standish, after emptying the cyst, swabbed it out with absorbent cotton dipped in tincture of iodine, and afterwards packed it with cotton. This plan had proved entirely satisfactory.

RUPTURE OF THE IRIS AT THE PUPILLARY MARGIN AND IN CONTINUITY FROM CONTUSION OF THE EYEBALL.[1]

By GEO. C. HARLAN, M.D., of Philadelphia.

THOUGH separation of the iris from its ciliary attachment as a result of a blow upon the eye is an accident of comparatively frequent occurrence, rupture of its pupillary border is much more rare, rupture in the continuity of the membrane is rarer still, and I have not been able to find any record of a case of the radiating form of the latter. I have thought, therefore, that it might be worth while to submit a brief report of the following cases, which furnish six instances of ciliary rupture, and two of radiating rupture in the continuity of the iris.

Case 1.—A. P. H., aged 51, was struck violently on the brow and eye with a chair, February 28, 1896. He was stunned by the blow and remained unconscious for a time. When seen at the Pennsylvania Hospital, twenty hours afterwards, there was a horizontal contused wound, 3 cm. long, above the outer half of the eyebrow, and a partially absorbed extravasation of blood beneath the skin of the brow, temple and lids, and also beneath the conjunctiva, chiefly on the temporal side. There was no blood in the anterior chamber. The pupil was irregularly dilated and im-

[1] Read before the American Ophthalmological Society, July, 1896.

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movable. Its long axis at an inclination of about 165° measured 7 mm., and the short axis $4\frac{1}{2}$ mm. There was a notch in its temporal border, a little above the horizontal meridian, which extended to within 3 mm. of the periphery of the iris. When examined by focal illumination, the apex of this notch was seen to be a ragged angle crossed by a network of fine thread-like fibres; these seemed to be a part of the iris stroma that had resisted the force which ruptured the muscle and vessels. There were also numerous minute serrations in the margin of the pupil, noticeable only by the use of a lens. By means of transmitted light, with the mirror and a strong convex eye-piece, a number of narrow radiating streaks of red fundus reflex could be seen on the surface of the iris: those on the inner and nasal portion being situated about midway between the free and the attached margins of the iris, and those above being near the edge of the notch. Thirteen of these minute ruptures could be counted, but they could not all be seen at the same time, as they could be detected only when brought into proper relation with the source of light and the eye of the observer. Careful inspection with focal illumination showed a slight peripheral trembling of the iris. As there was no other indication of disturbance of the lens, it seems possible that this may have been due to the shattered and relaxed condition of the membrane rather than to loss of support. The fundus was normal, and vision, with correction of a compound myopic astigmatism of about the same degree as existed in the other eye ($-2 \bigcirc -{\cdot}75c$, 130°), equalled $\frac{}{20}$.

The pupil was reduced in size to the extent of 1 mm. by the application of eserine continued for a week, but promptly resumed its former width when the eserine was discontinued.

Nearly three months later, the condition of the eye

remained the same. There had been no iritis. There was still no pupillary reflex. The accommodation equalled $\frac{1}{60}$, as compared with $\frac{1}{18}$ in the other eye.

Case 2.—An Italian, aged 30, was struck on the right eye by a piece of stone while quarrying, ten days before he was seen at the Pennsylvania Hospital (April 12, 1895). There was no other sign of injury than an irregularly dilated pupil, the long diameter of which, at 110°, measured 8 mm. and the shorter diameter 6 mm. Oblique illumination showed a number of minute serrations in the pupillary margin.

The man was illiterate and stupid, and vision could not be accurately measured; but it seemed to be the same as in the other eye. Accommodation, measured by the shadow test, was about 1 D. less. A solution of eserine, gr. ii. to f ℥i., acted very slowly; but at the end of an hour the pupil was much contracted, though still wider than that of the other eye, and irregular. This patient did not appear again, and could not be found.

Case 3.—N. V., a boy, aged 14, was struck on the left eye with a corn cob thrown violently by a play mate (April 7, 1896). Four hours afterwards there was slight pain with a good deal of photophobia, ecchymosis and swelling of lids, serous chemosis of conjunctiva and haziness of cornea. No blood in the anterior chamber, and no oscillation of the iris. Fundus indistinct, but apparently normal. Pupil widely dilated and fixed. Iced cloths were applied.

Two days later the pupil was rather less dilated, $6\frac{1}{2}$ mm., vertical diameter rather longer than horizontal; just perceptible reaction. V. equalled $\frac{4}{5}$, and with —·50, $\frac{6}{6}$. Oblique illumination showed three small but decided notches in the lower margin of the pupil, involving the muscle, and a number of minute serrations extending only through the uvea.

A week after the injury V. equalled $\frac{6}{6}$ without correc-

tion, and accommodation was the same as in the other eye. A solution of eserine, gr. ii. to f. ℥i, produced very little effect in half an hour. After the application of a solution of one-fourth that strength twice daily for a week, the pupil measured 3 mm. by $3\frac{1}{2}$ mm., but resumed its former size when the eserine was discontinued.

Four weeks after the injury there was no change, except a rather more decided reaction confined to the upper and lateral margins of the pupil, the lower margin where the rupture existed remaining as motionless as if adherent. There had been no iritis.

For the opportunity of seeing three other cases, I am indebted to Dr. C. A. Oliver, who has furnished me with the following notes :—

Case 4.—On November 15, 1893, H. P., a school boy, aged 8, came to the clinic at Wills' Eye Hospital, with a history that four days before the right eye was struck with a small piece of wood. Vision was immediately reduced to light perception. Pain was not complained of at any time. No local treatment had been employed except the use of water with a wash of boric acid.

Examination showed numerous small ecchymoses in the sub-mucous tissues of the eyeball. The upper lid was swollen. The cornea was hazy throughout its superficial layers, with loss of epithelium in a space corresponding to the pupillary area. The anterior chamber was deep with a hyphæma 3 mm. in height in its most dependent portion. The pupil was dilated. The iris was discoloured, drawn in, and did not react to light. Tension was slightly reduced. No view of the fundus could be obtained. Vision had fallen to ability to see hand movements at 50 cm. distance. The left eye was normal.

After the absorption of the intraocular hæmorrhage,

the eye-ground could be plainly seen. Slightly up and out from the fovea there was a black-bordered rupture of the choroid, which was concentric with the outer edge of the disc.

During the succeeding two months vision gradually increased until it had risen to $\frac{5}{20}$, without the use of any correcting glass. Re-examination at various intervals, averaging about two months apart, showed that the pupil remained the same size throughout the entire period of examination, and that there were two minute breaks in the lower portion of the pupillary edge of the iris, these extending about half a millimetre into the inner circle.

In July, 1894, a faint whitish reflex in the anterior cortical substance of the lens, slightly up and out, could be dimly seen; this has never increased in size.

In May of this year the eye and its vision were found to have remained the same. The appearance of the pupil and the broken portion of the pupillary edge of the iris were as before. Application of eserine produced a very slight contraction.

Case 5.—On June 22, 1896, R. J., a farmer, aged 62, applied at Wills' Eye Hospital for a glass to correct a high degree of myopia in his left eye. He stated that the vision of the right eye had been bad for the past three years, dating from an accident in which the eye had been struck with a piece of kindling wood.

Examination showed that there were two ruptures in the circular fibres of the iris, slightly down and out, between which positions the inner circle of the iris was inverted. The lens was slightly hazy, and there were numerous floating opacities in the vitreous. Vision was reduced to ability to count fingers at 43 cm.

Case 6.—C. R., aged 26, was a patient at the Wills' Eye Hospital clinic. Three years previously he had been struck on the right eye with a piece of thick

cardboard. He had experienced no trouble but diminution of vision. V. equalled $\frac{5}{15}$; accommodation was the same as in the other eye. There was a slight corneal nebula, a localised lenticular opacity down and out, and a rupture of the choroid concentric with the outer edge of the disc. The pupil was slightly dilated and oval, with its long axis at 90°, and responded to light except at its lower margin, which was fixed; and in this position oblique illumination showed two shallow notches. Examination with a mirror and a + 16 D. glass revealed eight small radiating ruptures of the iris beyond the sphincter, seen as minute red streaks of fundus reflex—six down and in, one down and out, and one up and in. There was just perceptible oscillation of the iris.

Franke[1] has collected thirteen cases of rupture of the sphincter, including one reported to this Society by Dr. Vermyne in 1878, but not including two others to which Vermyne referred as having been observed by Drs. Williams and Wadsworth; and the following three cases of rupture in continuity. He attributes the accident to stretching of the iris from flattening of the ball, and at the same time spasmodic contraction of the sphincter.

Case 1.—The well-known case of Lawson, which is frequently referred to as unique. The eye was struck by a rebounding rifle ball. There were two distinct pupils; the upper separated from the lower by a bridge of iris, and not reaching above to the ciliary margin. The margin of the new pupil was irregular and ragged. Lawson thought it was a rent in the iris which had opened out and formed a new pupil.

Case 2.—A case by Amédée, of Paris, also presented the appearance of two pupils. The natural one occu-

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[1] Graefe's *Archiv. f. Ophthalmologie*, 1886, Abth. ii., p. 261.

pied its normal position, while the "accidental pupil," which was above, had the form of a triangle, the apex of which touched the corneal limbus, and its base was separated from the natural pupil by a bridge of iris.

Case 3.—Case by Bünger. Contusion of the ball from a blow with a chain. There was an artificial pupil which could be distinguished from an iridectomy only by the fact that a band of iris remained at the ciliary margin. From an illustration accompanying the report, it is evident that there was an extensive vertical rent of the nasal segment of the iris, and at the same time also a rupture of the sphincter which united the new opening with the normal pupil.

Case 4.—To these may be added a case reported by Dr. Clark, of Columbus, O., in 1889.[1] The eye was struck by a rebounding rifle ball. There was an irregularly oval opening, about 1 mm. by $1\frac{1}{2}$mm. in diameter, in the upper and nasal quadrant of the iris, with a delicate web-like membrane stretched across its upper border.

In all these cases of rupture beyond the sphincter the tear was across the direction of the radiating fibres, which thus caused the wound to open out and form a rounded perforation somewhat resembling an additional pupil.

In a case reported by Reber[2] of a linear tear in the temporal segment, 4mm. in length and nearly vertical in direction—perpendicular to the radiating fibres—the tear could not have involved the whole thickness of the iris, as, if that had happened the wound would inevitably have gaped. This view is confirmed by the fact that four days after the accident all trace of the rupture had disappeared.

In the two cases of rupture in continuity just reported,

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[1] Knapp's *Archives of Ophthalmology*, vol. xviii., p. 12.

[2] *Archives of Ophthalmology*, April, 1896.

the edges of the small radial slits parallel to the iris fibres tend to approximate, which makes them much more difficult to detect. They can be seen only by transmitted light; oblique illumination does not discover them.

As would be expected from the nature of the accident, when the iris is ruptured by contusion the eye usually suffers some other injury, such as more or less extensive intraocular hæmorrhage, injury or dislocation of the lens, or, most frequently, rupture of the choroid; but the cases that I have reported, not including Dr. Oliver's, were remarkably free from serious complication. There was no blood in the anterior chamber, the acuteness of vision was not materially affected, and there was no iritis.

In the five cases remaining under observation—four weeks, six weeks, three months, two years, and three years after the injury—the mydriasis is permanent.

In two cases the accommodation was the same as in the sound eye, and in two it was only partially suspended. In the others it was not practicable to estimate it. Of the cases in literature I can find only four in which the accommodation is noted. In Vermyne's case the near point of the injured eye was eight inches, and of the sound eye three and a half inches. In Clark's the accommodation was reduced one half as compared to the other eye, but atropia had been used freely ten days before and its effect may not have passed off completely. In a case of Hirschberg's[1] there was no limitation of accommodation; and Meyhöfer records one in which there was accommodative spasm. In Meyhöfer's case,[2] which was one of multiple rupture of the sphincter, a myopia of $\frac{1}{18}$ promptly gave place to emmetropia under the use of

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[1] *Klin. Beobachtungen aus der Augenheilanstalt*, 1874, 33-38.

[2] Zehender's *Klin. Monatsbl. f. Augenheilk.*, xv., p. 66.

atropine. More than a year afterwards the pupil was still widely dilated.

It is probable that ruptures of the iris from contusion, particularly small multiple ruptures of the sphincter, are much more common than is usually supposed, and that, as Hirschberg suggests, they would be found if carefully searched for in all cases in which the mydriasis is permanent. No doubt they have been the cause of the mydriasis in many cases that have been looked upon as paralytic. I believe, however, that the paralytic form does occur as a result of contusion—a kind of peripheral stunning of the nerve fibres, which affects the accommodation equally with the pupil.

These cases yield quickly to the action of eserine, and would probably end in recovery in a little longer time without medication. I reported two such cases some years ago.[1] In one the pupil was widely dilated, and the accommodation was completely suspended. The patient was seen immediately after the accident, and no application had been made to the eye. With the correction of a low degree of hypermetropia, vision equalled $\frac{20}{20}$. Twenty minutes after a few drops of a solution of extract of calabar were applied the pupil was myotic and the far point was eight inches. This patient probably had no further trouble and he never presented himself again.

The other case was that of an assistant surgeon in the navy who, while in a Boston street car one evening, received a violent blow on the eye from the elbow of a fellow passenger who was attempting to close the sliding door. He suffered a good deal of pain at the time, but it soon subsided and he slept as usual. On rising in the morning he was horrified to find that the power of near vision had gone from the eye,

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[1] *Am. Jour. Med. Sci.*, cxxi., p. 139.

and that the iris also had nearly disappeared. He went at once to Dr. Williams, who treated the eye with calabar, and, after several applications repeated at intervals of two or three days, both the iris and ciliary muscle regained their power. When I saw him a few months later there was absolutely no difference between the eyes.

Hirschberg[1] has reported the case of a child, aged 8, in which, as the result of a contusion of the ball, there was wide mydriasis with paralysis of the accommodation, both of which disappeared entirely in two days; and in a case reported by Eales,[2] in which fixed dilatation of the pupil and loss of accommodation, without impairment of distant vision, resulted from a fall upon the head, the accommodation was completely restored in four days, and the pupil action in five days, after the accident.

When the mydriasis is accompanied by loss of accommodation, the possibility of rupture of the ciliary muscle, or injury of the lens or of its suspensory ligament must be considered; but this does not seem a probable condition in cases like those just cited, where complete recovery was so prompt.

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[1] *Loc. cit.*

[2] Torquay Med. Soc., Dec. 19, 1894.

NUEL (Liège). Alterations of the Macula. *Arch. d'Ophtalmologie, October*, 1895; *March and August*, 1896.

In these three papers Nuel treats of some points in the interesting subject of the pathology of the macular region. They are full of careful observation, and are well worth reading in the original; an abstract of a paper dealing largely with pathological appearances suffers in intelligibility from the absence of drawings of the conditions described.

(A) The Radiate Figure at the Macula in Renal Retinitis.

A particularly frequent appearance in renal retinitis, though it also occurs in other retino-choroidal affections, is an arrangement of glistening white dots in radiating lines around the macula. As an ophthalmoscopic object it is sufficiently well known, and sufficiently striking; it is curious, therefore, how few facts we possess as to its anatomical basis.

Nuel describes the microscopic appearances of sections of the macular region from two eyes of albuminuric patients in which the star figure was present. There was in each a small detachment of retina in the yellow spot region, conical in form, with the fovea at its apex. Across the base of the cone, between retina and choroid, stretched a thin lamella of exudation, homogeneous, but containing embedded in it the rods and cones, or the outer segments of them. It appeared in the whole series of sections involving the macular region, so that it must have formed a circular disc of corresponding dimensions.

In the retina itself the most striking alteration was in the *outer fibrous layer* of Henle, which is formed by the long obliquely-disposed cone fibres radiating from the fovea. Among these fibres was a series of large lacunæ, more or less globular in shape, of such a size that many of them occupied the whole thickness of the layer, and bulged slightly into the layers on either side. Each lacuna contained

a solid mass of albuminous exudate, and these masses evidently formed the white dots seen with the ophthalmoscope, their characteristic arrangement being due to the radial disposition of the fibres among which they lay. The globes of exudation rarely completely filled the lacunæ, appearing to have shrunk from their original volume; for the most part they were homogeneous in aspect, but some of them, especially in the case in which the disease appeared to have been of longer duration, presented a vacuolated central zone, probably fatty, or else a fibrillated structure. Many of the globes further had, in contact with them, peculiar cells, perhaps ten or a dozen to each globe, lying in depressions or even tunnels in their substance. These cells possessed a relatively large amount of protoplasm to their nuclei; they were evidently eating away the globes "like mice gnawing a loaf of bread," and were doubtless emigrated leucocytes overgrown by absorption of albuminous material.

The substance of the globes appeared to be quite similar to that of the layer of exudation beneath the macula, and to a process of shrinking of this layer similar to that which had evidently occurred in the globes Nuel would attribute the pushing forward of the retina at this spot. Evidence of the traction exerted by the shrinking was seen at the places where the exudation was adherent to the retina: here the rods and cones were drawn strongly inwards towards the fovea; and that the detachment existed *intra vitam* was shown by the condition of the cells of the outer granular layer, which were partially degenerate and stained badly over an area corresponding to the detachment.

Changes in the other retinal layers were comparatively slight, and in no way characteristic. The rods and cones of the macular area presented, to a considerable degree, the lengthening or hypertrophy, especially of their outer segments, which others have described. In the area of detachment they were wholly or partially torn away. A general interstitial œdema of the retina, shown by enlargement of the perivascular sheaths and the lymph spaces

round the ganglionic cells, was strongly marked in the more advanced case, less evident in the earlier. In the former case also there were, in the neighbourhood of the disc, large patches of "fibrinous" interstitial exudation in the internal granular layer.

(*B*) *Macular or Perifoveal Œdema*

forms the subject of Nuel's second paper; a condition which he considers plays an important *rôle* in ocular pathology, and one which again has almost escaped attention.

It has this in common with the condition last described, that it is in the layer of Henle that the most characteristic alterations are found. In an eye, blind from glaucoma, and excised for acute corneal ulcer, the appearances are thus described: "Over the whole extent of the macula, and even beyond it, the layer of Henle is the seat of a peculiar alteration. This layer is swollen; the distance between the internal granules and external molecular layer is considerably increased. The spaces between the fibres of Henle, merely virtual under normal conditions, are here rendered prominent by distension with a clear liquid. A certain sliding of the retinal layers on one another must have taken place, for the fibres of Henle pass perpendicularly through the retina, so that the two extremities of individual fibres are almost opposite to each other. These fibres, or trabeculæ of the layer of Henle, are always composite; they include a number of cone-fibres collected into a bundle, which separate from each other at either end: on the one hand to join the cones, on the other to enter the inner molecular layer. Laterally the trabeculæ are united by some very fine filaments." The other alterations in the retina, which are mainly an atrophy of the ganglion-cell and nerve-fibre layers, are evidently the result of the glaucomatous condition of the eye; and for a long time Nuel was inclined to regard the macular œdema as part of the same process. But other glaucomatous eyes did not show it, while it was found in a series of non-glaucomatous ones. The common characteristic of these latter was that they

were greatly inflamed, "irritated," in all their parts; and the conclusion was arrived at that the condition was an irritative or inflammatory œdema of the macula. Thus the second specimen described was from an eye wounded by a chip of stone, with perforation of cornea, wound of lens, hypopyon, greenish iris, and contraction of the visual field. After excision, a chip of flint was found in contact with the ciliary body; there were a few cells and some threads of fibrin in the vitreous; marked enlargement of the vessels of the choroid, but no evident diapedesis of leucocytes; in the retina, on the other hand, the perivascular sheaths and lymphatic spaces were stuffed with deeply staining cells; and in the optic nerve there was a marked interstitial inflammation. The œdema of the layer of Henle was extremely well marked, and very sharply limited to the macular area; it caused a nipple-like projection towards the vitreous of the fovea and its immediate surroundings, the elevation being so steep that the opposed bacillary surfaces of the retina were practically in contact, with merely a fissure between. The cones over this small area of detachment had practically disappeared; in its neighbourhood they showed an extreme degree of the longitudinal hypertrophy, which has been previously referred to. In this case, as in the former one, the vertical direction of the fibres of the layer of Henle indicated a riding of the retinal layers over one another, additional evidence of this being afforded by a relative thickening, or heaping-up, around the fovea of the layers internal to Henle's layer (the internal granules and the ganglion cells), with relative thinning of those external to it (the external granules). And to this pushing-in towards the fovea of the internal layers of the retina, Nuel would attribute the localised detachment; the motive force being the exudation of fluid into the tissue of the layer of Henle. That no such detachment was present in the former case is explained by the atrophic and unyielding condition of the internal layers.

In a third case, of which a drawing is given (an eye lost from the results of a large perforating ulcer of cornea), the

œdema of the layer of Henle presented the peculiarity that the spaces between the fibres were filled with small, clear, faintly-staining globules, evidently a form of fibrinous coagulum in the effused fluid. In this case an exactly similar macular detachment was present, at the apex of which the continuity of the retina was only maintained by a few fibres stretching across the position of the fovea ; while in two others, more briefly described, the detachment had attained greater dimensions, and there was an actual hole at the fovea. All of these were inflamed, painful, almost blind eyes ; and there is no doubt that the detachment of retina would soon have been complete, such as is found when enucleation is done at a later stage, characterised by complete loss of perception of light, softening, and commencing atrophy of the globe.

It is not to be supposed, however, that every eye presenting these macular changes is destined to be lost from atrophy or from panophthalmitis, or that the changes themselves can never be the subject of ophthalmoscopic examination during life. "If ophthalmoscopic treatises are more or less silent with regard to such changes, this does not prove that they are not to be seen. It must be remembered that, situated in the macular region, they are not very noticeable from their diffuse character ; and also because other and more striking appearances, particularly those of the disc, attract the attention. Those who make a habit of exploring the macular region by the direct method will certainly remember having met with, in certain cases of retinitis and choroiditis, diffused changes, greyish, radiate or not as the case may be, which we consider should be put down to œdema of the macula. The absolute central scotomata, which often remain as a sequel of these diseases, denote similarly small detachments having the fovea as a centre. The relapsing central retinitis of v. Graefe, syphilitic in origin, is characterised by a greyish opacity about the macula, extending as far as the disc, by a central scotoma and metamorphopsia. In our opinion, the greyish opacity is the expression of œdema ; the central scotoma and the metamorphopsia result from a foveal and

perifoveal detachment. In papillitis affecting, more or less, the surrounding retina, the macular region is often, at the commencement of the affection, occupied by a greyish opacity which may disappear later. Marcus Gunn has recently called attention to opacities of this kind, more or less radiating, situated in the yellow spot region, and associated with retinitis, or with non-inflammatory œdema of the retina. Probably even well-marked œdema of the macula may disappear without leaving any ophthalmoscopic traces, and with preservation of some degree of central vision. But the metamorphopsia and absolute central scotomata denote that there is, or has been, detachment of the fovea, detachment of which ophthalmoscopic evidence remains as pigmentary changes at the macula."

(*C*) *The Cherry-red Spot in Embolism of the Central Artery of the Retina.*

Nuel now turns to a case of embolism of the central artery of the retina, the microscopic examination of which he gives with a fulness and detail which would well have warranted its appearance under a separate title. That part of it which concerns the present subject may be briefly given.

The eye was enucleated six weeks after the occurrence of the embolism. During life the usual ophthalmoscopic appearances of embolism had been well marked, the cherry-red spot being, however, somewhat larger than usual, nearly as large as the disc, and shading off gradually into the surrounding pallor. There were numerous small retinal hæmorrhages, a very small one apparently occupying the centre of the macula.

On microscopic examination, besides the conditions of atrophy and œdema of the various layers, which have been described by other observers, the chief point of interest was in the light thrown on the cause of the red spot at the macula. While the vessels of the retina generally, especially the arteries and capillaries, were markedly empty, there were two regions which stood out in marked

contrast to the rest in this respect; around the papilla, and at the macula, there was great injection of the minute vessels and capillaries. The filling of the vessels in the former position was consistent with what we know of the capillary anastomoses between the retinal and posterior ciliary arteries; the condition of the macular vessels was less easy to explain, for it is specially noted that there was no direct cilio-retinal vessel passing to the macula. But whatever the cause of it, Nuel is convinced that it was to this engorgement of the macular vessels, and to this alone, that the appearance of the red spot was due in this case.

In Nuel's third paper he applies the facts gathered from the foregoing cases to the elucidation of a condition of the central region of the retina, as to which we have little or no direct pathological evidence, viz., the retinitis circinata of Fuchs.

(*D*) *Retinitis Circinata as a Typical Macular Affection.*

The author describes two examples of this disease which have come under his observation. In the first there was a pigmented patch at the macula, not prominent; on either side the typical crescent of small, sharply-defined, white spots; the retinal vessels were normal; the visual field was peripherally intact, but showed an absolute central scotoma extending 12° from the fixation point. In the second case, a detachment of retina, having a diameter more than double that of the disc, occupied the macular region; it projected to the extent of about 3 D, its surface was greyish-white, with just at the centre a dark spot, shading off at its edges, and corresponding to the fovea; this was not a hæmorrhage, but close to it above and below was a small spot of hæmorrhage, situated on a minute dilated venule. The crescents of white spots were here also typically developed; over them the retinal vessels passed unchanged. There was a central absolute scotoma of about the same extent as in the previous case.

The Macular Changes.—Fuchs describes in two of his cases a similar detachment, which he appears to regard as a more or less accidental complication; he also de-

scribes very clearly an œdema of the macula, producing a greyish patch and swelling of the retina. "Here we have typical cases of œdema of the layer of Henle; one could scarcely desire better examples of it. In one of our cases, and in two of Fuchs's, this œdema has given rise, by the process we have described, to a visible detachment of the perifoveal area. Very probably a similar detachment has been present to a less degree in most of the cases observed. When the detachment disappears it leaves behind it pigmentary changes at the macula; and, especially, the absolute central scotoma cannot be explained by the œdema merely without the help of the detachment."

The Ring of White Spots.—The similarity in appearance of these spots to those of the star figure in renal retinitis led De Wecker and Masselon to attribute to them a similar anatomical basis, and speak of the affection as a fatty degeneration of the retina. Nuel has, however, shown that the albuminuric changes are due to an exudate, which is primarily purely fibrinous, although some fatty changes may take place in it in later stages; and he has little doubt that the white spots of retinitis circinata are due to similar exudation in the external granular layer. Fuchs seems inclined to the same view, relying on a case described by Wedl and Bock, in which such exudation produced white spots visible by the ophthalmoscope.

"As to the localisation of the spots in the thickness of the retina, there can be no doubt that they are situated in the external layers, outside of the layer of internal granules; since the retinal vessels, even those of small calibre, pass over them. From the absence of all pigmentary change they must be within the rods and cones. Between these two limits the layer of external granules alone lends itself to a change of this nature.

"There remains their localisation in area in the retina. It has been observed in almost all cases, including our own, that primarily, at least, the spots are limited by a well-defined anatomical boundary, the peripheral limit of the perifoveal zone. In so far as it possesses a special struc-

ture, this zone extends considerably beyond the limits of the yellow spot. The latter has a diameter about equal to the disc. But the layer of Henle extends much beyond this. It diminishes in thickness as it extends outwards; and its furthest limit, beyond which the fibres of the rods and cones become perpendicular to the plane of the retina, while varying a little in different cases, extends as far, or nearly as far, as the temporal edge of the disc." A circle, therefore, with a radius corresponding to the distance between the fovea and the disc would form the outer limit of the perifoveal zone; and within this, Nuel contends, the white spots are always included; "in some rare cases, perhaps, they pass beyond it." "The spots, moreover, have a distinct tendency to be grouped in lines radiating from the fovea as a centre; this is especially marked when the spots are small and numerous, but remains apparent even when by their growth they have become more or less confluent. And there is no structure in this region having a radiate arrangement except the layer of Henle."

Interesting as these views are they can hardly be accepted, as Nuel would doubtless himself admit, as the last word on the subject, while direct pathological evidence is still wanting. Thus, while it may be granted that it seems very probable that the primary deposit takes place in the layer of Henle, it is impossible to restrict it as definitely to this layer as Nuel would do, for cases have occurred in which a part of the ellipse of white spots was situated on the nasal side of the disc, which can hardly be included in the perifoveal area, even with the extended signification of that term which Nuel adopts. Such a case is described by De Wecker (*Arch. d'Ophtal.*, January, 1894, p. 26); and another was recently shown by the reviewer at a meeting of the Ophthalmological Society of the United Kingdom (*Trans.*, vol. xvi.). The latter case may also be referred to as traversing Nuel's view as to the dependence of the central pigmentation on a past perifoveal detachment of the retina; in the right eye of this patient the pigment patch was sufficiently characteristic, but V. was $\frac{6}{9}$, with no indication that it had been worse, and with certainly no

absolute, hardly a relative scotoma ; conditions which it is difficult to reconcile with the theory of detachment.

(*E*) *The Central Scotoma of Toxic Amblyopia is a Primary Affection of the Macula, not an Interstitial Neuritis.*

Since Samelsohn's classical description of toxic amblyopia, and the pathological appearances with which it is associated, the central scotoma of this affection has been regarded without demur as the result of an interstitial neuritis, limited to the macular bundle of the optic nerve. It is, however, notoriously difficult to distinguish between an inflammation of the connective tissue of a nerve causing secondary atrophy of the nerve fibres, and a primary atrophy of the latter with the secondary interstitial changes which follow in its track. The descriptions of the optic nerves in the recorded cases agree quite as well with the second condition as with the first. Bunge, indeed, speaks of it definitely as a simple atrophy. Moreover, no observer appears to have examined sections of the macular region itself. This, Nuel has now been able to do in a case which he here describes.

The material was obtained from an eye enucleated in the surgical clinique for cancer of the orbit not involving the globe or nerve, beyond which, unfortunately, absolutely no clinical facts are forthcoming : "the diagnosis was made under the microscope." Sections of the nerve showed the typical appearances of a toxic amblyopia, the atrophic bundle lying in the centre of the nerve at the optic foramen, inclining to the outer side at the entrance of the central vessels, and finally occupying the temporal portion of the disc. At the macula, "besides simple atrophy of the nerve-fibres passing outwards from the disc, there is an almost complete disappearance of the gangion-cells. Only a single row of these elements is to be seen, and even they are more or less deformed. Beyond the limits of the macular zone the ganglion-cells are normal."

Nuel is of opinion that this atrophy of nerve cells is

primary, and, therefore, the cause, and not the consequence, of the atrophy of the central bundle in the nerve. His reasons for this view are mainly two. In the first place, the sections of the nerve in its whole length show the appearances of a simple atrophy, nowhere consecutive to interstitial neuritis. "In transverse section, the fasciculi of fibres are reduced in volume progressively towards the centre of the macular bundle. At the very edge of the affected portion, while not diminished in bulk, they have become lacunar by loss of some of their fibres. The fasciculi which are most reduced are simply granular in transverse section; nowhere is there any increase of nuclei within the fasciculus. Even in slight degrees of interstitial neuritis the number of nuclei is sensibly increased; and, moreover, the inter-fascicular septa of connective tissue send out more or less developed prolongations into the interior of the fasciculi. In our case there is no trace of such processes." That the septa were increased in thickness, and this progressively from the periphery to the centre of the atrophic bundle, Nuel regards as a necessary consequence of the reduction in volume of the nerve bundles, and in no way an evidence of neuritis. The number of nuclei in the septa appeared to be slightly increased, and possibly the vessels were slightly hypertrophied; but such alterations in the connective tissue are always to be found in nerves undergoing simple degeneration.

Secondly, Masius has recently obtained in dogs a condition of complete and permanent amaurosis with atrophy of the fibres of the optic nerves by the administration of extract of male fern. Nuel, repeating the experiments, found that when the blindness had existed one to two days only there was degeneration or even disappearance of the nerve fibres, but no sign of neuritis; later, the appearance, especially about the region of the optic foramen, bore some resemblance to an interstitial neuritis. The ganglion-cells in the retina were from the first destroyed, or greatly altered. His experiments are not yet completed, but he considers it proved "that the filicic acid attacks first the

nerve cells of the retina, and that their destruction entails the degeneration of the fibres of the optic nerve, which form part of the neurone of the cells affected. Hence it seems to us extremely probable that in other toxic amblyopias the same process occurs, that is to say, that alcohol and tobacco attack the nerve cells of the macula, and that the corresponding fibres degenerate secondarily, and without the intervention of a neuritis." In answer to the objection that the degeneration of the nerve cells might be consecutive to the destruction of the fibres, Nuel refers to the researches of Krenchel and of Rosow, showing that section of the nerve causes atrophy of the cells only after four to six weeks; while the cells had disappeared at a much earlier date in the experimental amaurosis from male fern. Another objection is that in cases of toxic amblyopia no changes can be seen at the macula with the ophthalmoscope. Nuel, however, has not infrequently found, especially in advanced cases, small pale granules at the macula; and in three cases seen recently he believes that the macula presented a greyer tint than normal.

In this connection it may be mentioned that the reviewer has under observation at present a case in which the functional examination points to tobacco amblyopia, while each yellow spot presents slight greyish changes. It is hoped to give an account of it in a future number of the Review.

W. G. LAWS.

EUGEN V. HIPPEL (Heidelberg). Keratitis Parenchymatosa. *v. Graefe's Archiv.*, *xlii.*, 2, *pp.* 194-327.

The author's expressed object in the above paper is to study the ætiology of parenchymatous keratitis with special attention to the possibility of the disease being induced by tuberculosis, the probability of which has been shown by him in a former article (*v. Graefe's Archiv.*, xxxix., 3). With this object he has carefully investigated 87 cases under his own observation (62 were from Professor Leber's clinique), and has critically examined a vast amount of published cases. The list of the literature totals up to 323 publications, the first being Hutchinson's, in 1858. Those who are keenly interested in the subject should consult the original, as it is only possible here to give a brief extract of the author's conclusions:—

1. There is probably no essential difference between a clinically primary and a clinically secondary parenchymatous keratitis. The anatomical demonstration has not yet been made that the cornea alone is diseased in any single case of clinically primary keratitis; and the clinical, anatomical and experimental evidence all goes to show that even when the keratitis is clinically primary, it is but a concomitant or even an effect of disease in the uveal tract.

2. The keratitis parenchymatosa which is clinically primary cannot be attributed to one sole cause.

3. It is in the highest degree probable that hereditary syphilis is the most important and most common cause of the disease.

4. That syphilis is not the only cause may be inferred from (*a*) the absence of other evidence of syphilis, hereditary or acquired, in from 30 to 50 per cent. of the published cases; (*b*) the occurrence of parenchymatous keratitis in other animals, which are not affected by syphilis; (*c*) the anatomical evidence that the disease can very probably be due to tuberculous infection; (*d*) the fact that diseases of the uveal tract may be due

to various different causes; (*e*) the fact that persons of advanced age may suffer from keratitis parenchymatosa without any acquired syphilis.

5. The characteristic teeth described by Hutchinson do not seem to be present in the majority of cases. Their presence is probable but not certain evidence of hereditary syphilis.

6. Deafness can only be regarded as evidence of hereditary syphilis when it occurs in an acute form with subjective symptoms and no signs of tympanic disease, or when it comes on in young children without any symptoms except prevalent otorrhœa. Purulent otorrhœa *per se* cannot be regarded as evidence of syphilis having regard to the frequency of tubercular otitis media.

7. The occurrence of joint affections (pain, effusion, tumor albus, suppuration) in the knee, elbow, foot, hand, &c., which are due to hereditary syphilis, and benefited by iodide of potash, is a recognised complication of parenchymatous keratitis. As such affections are found also in tuberculous individuals who are not syphilitic, we must admit the possibility of these joint affections being in some cases tuberculous.

8. The demonstration that in a certain number of recorded cases no evidence of hereditary syphilis has been found, and that tuberculous infection or actual tuberculosis in various organs has been recorded, allows us to assert that most probably a certain number of the cases of parenchymatous keratitis are due to a tubercular infection of the eye of a relatively mild type. We cannot as yet determine the percentage of cases which are tubercular.

9. Rheumatism and malaria seem to be of etiological importance in many cases, but the influence of diabetes and influenza is not certainly proved.

10. Hutchinson's assertion that the typical form of parenchymatous keratitis is always the result of syphilis, and is of itself sufficient to justify the diagnosis, cannot be accepted, inasmuch as really exact clinical differentiation between the typical and the non-typical cases is as yet

impossible. (*a*) Keratitis punctata and synechiæ occur in both the probably syphilitic and the probably tubercular cases. In both the affection is bilateral, and the cervical inflammation diffused. (*b*) The typical arrangement of deep lying corneal vessels which is found so frequently (but not always) after the syphilitic disease, is found also after attacks which are probably tuberculous. (*c*) The same is true of the choroido-retinal lesions, which are seen ophthalmoscopically sometimes before the development of the keratitis, and sometimes, but by no means always, after it has cleared away. (*d*) Inflammatory nodules in the iris, the angle of the anterior chamber and the cornea appear to be more usual in the tubercular variety of the disease, but are seen in syphilitic cases also. They cannot, therefore, give certainty to the differential diagnosis. It must be remembered that tuberculosis may attack the eye of a person affected with hereditary syphilis.

11. Relapses are frequent (in 17 per cent. of v. Hippel's cases).

12. It is hard to be certain of the effects of treatment. The varying severity of the individual cases, and the fact that the majority recover, even without treatment, render a decision difficult. (*a*) No treatment has been adopted as yet which can prevent the disease breaking out in the second eye. (*b*) If syphilis is present an anti-syphilitic treatment is indicated, although perhaps the keratitis may not be much affected thereby. (*c*) Subconjunctival injections can only be regarded as an aid to general treatment. (*d*) Individual cases, when syphilis was absent, seem to have been benefited by salicylate of soda. (*e*) Paracentesis of the anterior chamber has had good results, but the observations are too few at present to enable us to give it a definite therapeutic value. (*f*) Iridectomy (except on other well recognised indications) gets no support from the cases investigated by v. Hippel. (*g*) In certain cases, when only a portion of the periphery of the cornea is implicated, excision of the diseased tissue may prevent the further progress of the disease. This is based upon a case of Leber's, when the operation was

performed with a successful result. Most of the evidence for the above conclusions is drawn from v. Hippel's own 87 cases. Of these he classifies 23 as certainly or probably affected with hereditary syphilis, and 15 doubtful. In 26 out of the whole number there was evidence pointing to the presence of tuberculosis, but in 8 of these the evidence for syphilis was stronger than that for tubercle. In the remaining 18 v. Hippel found the evidence for tuberculosis either quite preponderating or at least greater. In 18 cases out of the whole number joint affections were present. Five of these were certainly, and 2 probably, syphilitic. In 2 others there was evidence both of syphilis and of tuberculosis. In 1 tuberculosis was almost certain, and in 2 others very probable. In 1 case rheumatism was certain, and in 2 others probable. In 2 cases no conclusion could be arrived at as to the etiology. In 17 cases inflammatory nodules were present in iris, angle of anterior chamber or cornea. In 4 of these hereditary lues was almost certainly present, in 8 tuberculosis, and in 5 (as no other cause was evident) tuberculosis may be suspected.

J. B. S.

R. W. DOYNE (Oxford). Notes on the More Common Diseases of the Eye. London: H. K. Lewis, 1896.

The object which the author has in view in publishing this little book he explains shortly in the preface. It is to "give a general idea of the more common eye troubles and the principles that underlie their treatment, and to point out some of the practical difficulties and mistakes that may occur."

The general practitioner, more particularly the practitioner who knows little or nothing of ophthalmology, is the person for whose special benefit this book has been written. "It is difficult, if not impossible," says the writer, "for medical men who have been for many years in busy practice to follow a comprehensive book, on account of the relatively small number of illustrative eye cases seen by a general practitioner."

Perhaps he is right, and it may be that the forty pages of Mr. Doyne's monograph supply a want which even the smaller of the text-books fail to fill; nevertheless, we have a shrewd suspicion that the general practitioner is not always properly grateful for the, so to speak, "reading made easy" productions which are supplied to him with such liberality in every branch of his profession. After all, every practitioner is not so very busy, and even those who are could probably afford the time to master all the truths that Mr. Doyne's book contains, and a good many more, by a perusal of the less technical chapters of a general text-book.

We say this with no sort of animus against the volume under review, which, so far as it goes, is an excellent little book, but rather as a protest against a system, far too prevalent in our opinion, of issuing in book form the merest fragmentary outline of a subject, armed with which the country doctor is expected to combat the diseases mentioned (they cannot be said to be described), or at least to avoid the pitfalls which lie yawning in his way. Possibly such books do good in some instances; we

are convinced that in many others, by encouraging a false confidence, they do a grievous deal of harm.

Our protest once made, we hasten to say that Mr. Doyne's book has, in itself, many good points. It is clearly and forcibly written ; the honesty of the author's intention to write simply with a view to helpfulness is obvious throughout ; it contains many useful hints on the treatment of the ordinary forms of external eye disease ; and last, but not least, it strongly emphasises the extreme importance of an early recognition of glaucoma. Indeed, we wish Mr. Doyne had said more on this subject, even if he had been compelled to sacrifice, for example, the fourteen and a half lines devoted to astigmatism, or the half page to myopia.

We are sorry, also, to miss more definite reference to the danger of perforating wounds of the cornea and the sympathetic ophthalmitis that may follow. From the point of view of warning the general practitioner who may not be versed in ophthalmology against serious errors, we should have placed this subject as next in importance to glaucoma.

CATTANEO (Bologna). Midrol: its Action and Uses. *Annali di Ottalmol., fasc. iv.*, 1896.

The writer gives the results of his investigations on the actions of this drug, which chemically is iodomethylate of phenyl-pyrazolone, and is obtained synthetically. It is a white, amorphous, sticky, odourless, bitter powder, soluble in cold water, from which it crystallises in shining laminæ, soluble in alcohol.

When a drop of a 10 per cent. solution is instilled into the eye, after a minute or two the conjunctiva becomes paler; and this pallor, the result of ischæmia, lasts as long as an hour; the conjunctival but not the corneal sensibility is somewhat lowered. Mydriasis, which is preceded by slight and transient myosis, sets in about ten minutes after instillation, and reaches its maximum (5 to 7·5 mm.) in from a half to one hour; this is maintained for one and a half to two and a half hours, after which the pupil gradually regains its normal size in from twenty to thirty-six hours. Even with maximum mydriasis the light and accommodation reflexes are not altogether abolished. With stronger solutions the degree of mydriasis is greater. Its action on the pupil is chiefly due to stimulation of the sympathetic, the blood vessels of the iris being also contracted; in addition, it causes paresis of the third nerve endings. Weak solutions bear no action on accommodation. Repeated instillation of strong solutions causes slight paresis of the ciliary muscle, lasting from one to three or four hours; on an average accommodation is reduced $\frac{1}{2}$ to 1 D., exceptionally, $1\frac{1}{2}$ to 2 D.

Under its use the palpebral fissure becomes enlarged, and the globe becomes more prominent. The field of vision would seem to be restricted 7° to 10° externally, and extended 6° to 11° internally.

The ocular tension, as estimated with Fick's ophthalmometer and by digital palpation, is, in most cases, slightly diminished; repeated instillation of a strong solution (25 per cent.) is needed to obtain any sensible increase of tension. With regard to its action in eyes under the

influence of myotics, it is ineffectual against $\frac{1}{2}$ per cent. eserine, but it lessens the hyperæmia which the latter occasions, and to some extent limits the duration of the myosis. By repeated instillation of 5 per cent. iodo-methylate the effect of a drop of 3 per cent. eserine is overcome. The effect of one drop of 2 per cent. pilocarpine nitrate can be neutralised by one drop of 25 per cent. iodo-methylate, or by several drops of 10 per cent.

Its application causes no local irritation, nor does it tend to affect the corneal epithelium, and it gives rise to no general symptoms.

On account of its innocuousness and the very slight subjective disturbance of vision it occasions, Cattaneo thinks it may fill a place as a mydriatic for diagnostic purposes, especially in cases where increased tension is undesirable. Its action can be enhanced by the previous use of 2 per cent. cocaine. Therapeutically it may be used with advantage (in place of other mydriatics) in phlyctenular and other ulcers of cornea, and affections accompanied by conjunctival injection, lacrymation, photophobia, &c.

W. Watson Griffin.

A SHORT NOTE ON THE VALUE OF THE IMMEDIATE USE OF HOT WATER AFTER ENUCLEATION OF THE EYEBALL.

By SIMEON SNELL, F.R.C.S.Edin.

OPHTHALMIC SURGEON TO THE SHEFFIELD GENERAL INFIRMARY.

THE value of hot water as a hæmostatic in surgical and obstetric cases has been recognised, and its employment has become an established practice.

It is now several years ago, after hearing a paper setting forth the benefit that hot water had been in some surgical case, that I was led to think it would be of service in controlling the hæmorrhage following enucleation of the eyeball. The idea was at once put into practice, and, proving a success, has been followed to the present time. Its value is distinct, and the object of this short note is to draw attention to the proceeding. The method adopted has been as follows :—

Immediately after the conclusion of the operation, and whilst the patient is under the influence of the anæsthetic, the parts are dried as much as possible with a pledget of cotton wool, and then a roll of cotton wool, which has been dipped in very hot water, is immediately plunged into the socket. Bleeding will often be arrested at once, but, if necessary, the proceeding may be repeated, and then, if the bleeding has not entirely ceased, it will generally amount to no more than a little oozing. The usual

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pad and bandage may be applied with the eye practically dry.

Recently I have found a ready means of providing the hot water. A simple beaker filled with distilled water and made to boil over a spirit lamp is always at hand at operations for sterilising the instruments—a modification of a plan I learned from Mr. Priestley Smith—and the hot water required for the pledget of wool is therefore ready for use.

My experience has been so satisfactory with the hot water as a hæmostatic that the method has been regularly used in my practice. Another advantage, and one perhaps not less important, is that recovery is promoted and the socket is healed some days earlier than would have been the case if the hot water had not been applied. I was much struck with a remark the Sister in charge of my male patients at the Infirmary made the other day. There were two men in the ward who had undergone enucleation of the eyeball. One was operated on four days earlier than the other. On my observing, a few days after the last operation, that this patient was progressing more quickly than the first, the Sister remarked, "Yes, you used the hot water in this case, but you did not do so in the other." She further added that she had observed the same thing before when by any chance the hot water had been omitted.

I have mentioned this observation of the Sister, who has for long had charge of my patients, as it is corroborative of my own impression. I think, also, that the sealing up of the vessels and the general aseptic conditions due to the use of the hot water are features that should make for a ready healing of the tissues.

It is possible that others may have adopted this method, but, as I have not seen it mentioned, it seems worth drawing attention to.

Von Kries. On the Functional Differences between the Central and Adjacent Parts of the Retina. *Graefe's Archiv.*, xlii., 3.

In the July number of the Ophthalmic Review an article by Charpentier is reviewed in which he distinguishes three retinal zones according to their sensitiveness to light of "minimum illumination;" (1) the fovea centralis, in which, with this condition, neither white nor coloured light can be perceived; (2) the region immediately surrounding the fovea, in which coloured but not white light is best perceived; and (3) the remainder of the retina, in which white light is best perceived, and coloured light badly, but better as the second zone is approached. Since the functional differences between the first two zones do not correspond to the anatomical distribution of the rods and cones, Charpentier does not believe that the differences in their structures bear any relation to the functional differences in question.

In the present article, Prof. v. Kries expounds his own views on this subject, which are as follows. In the retina there are two distinct apparatus for the perception of light, one situated in the cones, the other in the rods. The former alone has to do with the perception of objects in a bright light, and alone has anything to do with the perception of colour. The "dim light apparatus" contained in the rods, on the other hand, has to do solely with the perception of colourless light, and possesses a remarkable power of adaptation to varying degrees of dimness, a power which is probably connected with the behaviour of the visual purple. Although the dim light apparatus is incapable of causing the perception of colour, as such, it is acted upon by the coloured rays to an extent which varies directly as their refrangibility, or inversely as their wavelengths, so that while the red end of the spectrum hardly excites it at all, blue light acts upon it far more readily, giving rise, however, to a sensation, not different in kind from that produced by colourless light. At the fovea and area immediately surrounding it, where rods are absent,

there is only one apparatus, that adapted for bright light and for the perception of colour. In all other parts of the retina there are two separate apparatus, which are called into play to varying extents, according to the brightness or dimness of the illumination.

Thus is explained the phenomenon known as "Purkinje's," viz.: while with a good illumination a red and a blue light appear equal in brightness, they appear very unequal as the illumination is diminished, until with a "minimum illumination" the blue appears a very great deal brighter than the red. At first the cones alone are brought into play, but as the illumination is diminished, the rod-apparatus also becomes active, and to the gradually diminishing perception of coloured a gradually increasing perception of colourless light is added. This, however, is only true of the short-waved blue light, not of the long-waved red. Hence the latter appears dark, and the former, while it becomes a less pure blue, retains to some extent the appearance of brightness.

(1) *Absence of "Purkinje's" Phenomenon at the Fovea.*—In proof of his theory, our author invites us to a more detailed study of "Purkinje's" phenomenon, when vision is confined to the central part of the retina. For this purpose, it is essential in the first place for the experimenter to learn how to fix a minute object in a dim light, so that it is accurately imaged on his fovea. In a black screen a minute hole is bored, which, with a light behind it, serves as a fixation mark. A disc of white paper, 3 mm. in diameter, is placed on a stand in front of the screen, movable horizontally, and on a level with the fixation mark, and 6 cc. to one side of it. All is now dark except the minute fixation mark, and the observer allows fifteen minutes for the adaptation of his retina, after which the illumination on the front of the screen is gradually increased until the white disc just becomes visible to the observer, who fixes the light spot from a distance of 50 cc. If now the white disc is moved horizontally towards the fixation mark, at a certain distance from it it disappears just as an object disappears when it is brought in front of the blind spot. Further, if the paper

disc is removed to a distance at which it becomes visible again, and the observer turns his eye towards it, it again disappears. This, however, is the difficulty, for in order to see what he tries to look at the observer is tempted to direct, not his fovea, but the neighbouring part of his retina towards it. The disappearance of a spot under minimum illumination, however, is the test of foveal fixation, and until one has learnt it, it is useless to experiment further on this subject.

If now with exact foveal fixation two half-discs of red and blue are seen under a sufficiently small angle, and with diminishing illumination, our author cannot find that either one appears to become brighter than the other. To meet the objection of personal bias, however, the following experiment was performed by four other skilled observers. By Helmholtz's apparatus a circular field, half red and half blue, was presented to the observer, who, by regulating the amount of light on each half of the field had to make both halves equally bright, first employing a maximum, and then minimum illumination. A fixation point was provided in the centre, and the magnitude of the field such that it was viewed under an angle of 1·6°. The result was that on the average the amount of blue light found to be equivalent to the red in the bright light, was very much the same as was necessary in the dim light.

(2) *A Phenomenon observed by the Colour-blind.*—To a person who possesses only two instead of three primary colour sensations (dichromatic), light of a certain wave length (about 495 μ μ) appears colourless. A mixture of red and blue also appears colourless. Suppose that under good illumination the pure light and the mixture appear equally bright; if now the illumination be diminished, this will no longer be the case, but the pure light will appear the brighter. The explanation is that while in the bright light the cones are equally sensitive to the stimulus of the pure light and the mixture, in the dim light the rods are unequally sensitive to the two, for to the red rays they are almost wholly blind. The importance of this fact consists in its furnishing evidence quite independent of the special

properties of the fovea ; even if the absence of Purkinje's phenomenon at the fovea were disproved (as Koster, to whose paper in the last vol. of the *Archiv.* the present is a reply, maintains), the above fact would point to the existence of two separate apparatus. The evidence is much strengthened by the further fact that when vision was confined to the fovea (two skilled dichromatic observers making the experiment with all due precautions), the above phenomenon was *not* observed.

(3) *Colourless Appearance of Coloured Light at the Fovea when observed under a Minimum Illumination.*—This is a phenomenon which tells against the author's theory. To answer the objection founded upon it, he argues : (1) If unsaturated colours, *i.e.*, colours mixed with white, are used, it is no objection to his theory ; (2) if the fact is true when pure colours are used, the phenomenon may be due to central (cerebral) causes ; (3) as far as the author's own observations go, and those of two of his friends, the alleged phenomenon is not a fact, at any rate as regards blue and green light.

(4) *Recurrent Vision.*—The image of a flame quickly moved in front of a dark screen is seen by an observer, who does *not* follow it but keeps his eye fixed, to be followed by a second image at some little distance from the first. At a certain distance from the point fixed by the fovea the second image disappears, and reappears at a corresponding distance on the other side. This is a further fact pointing to the existence of two separate apparatus over the whole of the retina except the macular region.

(5) *Hemeralopia.*—Simple congenital night-blindness is, our author maintains, an affection of the rods. Experimenting with a hemeralopic student he found (1) a greatly diminished sensibility to blue light with minimum illumination (Purkinje's phenomenon hardly observed at all) ; (2) the phenomenon of recurrent vision apparently absent.

(6) *Extent of a Rodless Area at the Centre.*—Finally, by comparing the actual extent of the central area found by the anatomical investigations of Koster to be free from rods with the central portion of the visual field found by his own experiments to be without the dim light apparatus,

our author finds such a correspondence between the two as, he maintains, tells rather in favour of than against his theory. There are, however, certain difficulties in this connection which leave the theory incomplete. One is that in those rods which are nearest to the fovea, and at a distance from it at which the phenomena indicative of the double apparatus are present, the existence of the visual purple cannot be demonstrated.

A. H. THOMPSON.

LUDWIG BACH (Würzburg). Experimental Studies, &c., on Sympathetic Ophthalmia. *Von Graefe's Archiv., xlii.*, 1, *p.* 241, 1896.

In a comprehensive paper by Schirmer, reviewed in these pages three years ago (OPHTH. REV., vol. xii., p. 83), the whole of the existing evidence concerning the nature of sympathetic ophthalmia was examined and discussed. The conclusions arrived at were strongly in favour of the theory which ascribes the disease to bacterial migration. To this same view a majority of writers have, during recent years, given their adhesion. The author of the present paper re-opens the question, and re-affirms the theory of nerve-irritation; firstly, on the ground of the negative results which have attended attempts to prove the migration theory by experiment; and, secondly, by reason of certain experimental results of his own which appear to point the other way.

Like other experimenters, Bach attempted to induce sympathetic ophthalmia in rabbits by the injection of the staphylococcus, the pneumococcus, and, lastly, the tubercle bacillus, into the vitreous chamber of one eye. The result was always negative as regards the fellow eye, and the

examination of the nerves and chiasma after various intervals showed no evidence of migration of the organisms. Having regard to the hypothesis that such migration is in certain cases prevented by rapid suppuration in the inoculated eye, he next repeated these experiments, using a staphylococcus of diminished virulence, but again with negative result. In the next place he made, in a series of cases, injections directly into the optic nerve, using the same material as before. The duration of the observation period varied from four days to four months. In no case was sympathetic inflammation induced. Culture tests with portions of the infected nerve and the chiasma showed that after two or three weeks neither the staphylococcus nor the pneumococcus remained active. The tubercle bacillus was discoverable microscopically at the seat of infection after longer periods.

The second section of Bach's paper deals with the bacteriological examination of sixteen eyes, which were excised on account of the danger of sympathetic ophthalmia; in four cases sympathetic ophthalmia had already broken out in the fellow eye at the time of the excision. In the majority of these examinations culture tests were made. The nutrient substances employed were agar in various concentrations, glycerine - agar, gelatine, blood-serum, broth, and the sterile vitreous of the calf, pig, and rabbit, and the tests were both ærobic and anærobic. The result was negative in every case.

The next point investigated was the nature of the healing process after resection of the optic nerve in rabbits. The fact that sympathetic ophthalmia has been known to occur in spite of the removal of a portion of the nerve, is a difficulty in the way of accepting the migration theory. To meet this difficulty, Deutschmann made a series of experiments on rabbits, removing portions of the optic nerve, injecting the sheath of the nerve with Indian ink after various intervals from the meninges, and subsequently examining with the microscope. He came to the conclusion that the divided nerve-ends became re-united by a fibrous connection, which, though failing to re-establish nerve currents, sufficed to

transmit the injected fluid from the central to the peripheral portion of the nerve; and he maintained the possibility that by this same path a pathological virus, whether consisting of microbes or of their products, might travel in the opposite direction. Bach experimented in a similar way, and came, as Velhagen* had also done, to the following conclusions:—At about four weeks after the resection, the divided nerve becomes impermeable by fluid injected from the meninges—the fluid does not pass beyond the cicatrised nerve-end; the tissue which re-unites the nerve-ends has the well-known characters of cicatricial tissue; it is not especially vascular, and presents no endothelial lining. These characters are opposed to the migration theory of sympathetic ophthalmia.

In the next section Bach revives certain other well-known objections to the migration theory, *e.g.*, the protective influence of suppurative panophthalmitis; the absence of meningitis; the long periods of quiescence before the outbreak in the second eye; and the apparent onset of the sympathetic disease in the ciliary body and iris rather than at the papilla. With regard to the hypothesis, that failure to find the organism in the second eye may depend upon the unsuitableness of the nutrient material employed, he points out that the vitreous substance itself, which should be a suitable material, gives negative results.

In addition to this negative evidence, Bach obtained by further experiments some positive results which seem to favour the nerve-irritation theory. Starting with the fact that inflammation of the iris and ciliary body is invariably associated with a change in the constitution of the aqueous fluid, he determined to ascertain whether such change could be induced in one eye by irritation of the other. Experimenting with rabbits, he irritated the one eye in various ways, *e.g.*, by irrigating it with a sublimate solution (1 to 1000), by the faradic brush, by mechanical irritation with or without perforation, by nitrate of silver applied to the cornea, &c. During, or immediately after, this proceeding the other eye was removed under chloroform, and then,

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* See page 293.

after preparation in formol, &c., was examined microscopically and chemically for the presence of fibrin in the aqueous humour. On careful comparison with normal eyes he found very manifest changes, namely, the presence of fibrinous exudations, and, in some cases, of the corpuscular elements of the blood. These exudations were present, not in the anterior chamber only, but between the ciliary processes in the peripheral parts of the vitreous, and occasionally between the choroid and retina. He quotes observations of a similar kind from other experimenters. His conclusion is that a prolonged irritation of one eye produces vascular dilatation and escape of the blood constituents, not only in this eye but in the fellow eye also, and that these changes are the first stage of an inflammatory process which, under long continuance of severe irritation, develop into sympathetic ophthalmia. According to this theory the induction of sympathetic ophthalmia depends less on the nature of the irritant, whether bacterial or chemical, than on the duration and intensity of the irritation. A predisposition to sympathetic affection would depend on the special irritability of the nervous system and a lowered tone in the blood vessels of the eye secondarily affected.

Bach, therefore, maintains that the ciliary nerves and not the optic nerve, are, after all, the channel through which the second eye is influenced ; and that the term sympathetic ophthalmia, rather than migratory ophthalmia, is the one which truly describes the malady.

P. S.

VELHAGEN (Göttingen). Experimental and Anatomical Study of the Process of Repair after Neurectomy of the Optic Nerve in the Rabbit. *Archives of Ophthalmology*, *xxv.*, 3.

The author's investigations were undertaken with a view to confirming or contradicting the results obtained by Deutschmann, when, in his study of sympathetic ophthalmia, he performed a series of similar experiments.

One of the most telling arguments against Deutschmann's theory of the propagation of sympathetic ophthalmia is that, in at least two acknowledged cases, the disease has occurred despite the fact that neurectomy of the optic nerve had been previously performed.

One of these cases was observed by Trousseau. Phthisis of the left eye occurred as a result of a perforating injury received four years before. The globe suddenly became painful and the other irritated, so it was determined to excise a portion of the optic nerve of the left (injured) eye. This was accordingly done, 4 to 5 mm. of the nerve being resected. Irido-cyclitis of the right came on, however, thirteen weeks later, and the left had finally to be enucleated.

The other case occurred in the practice of Schmidt-Rimpler, and was also the result of a perforating wound of the left globe. Six months after the injury, the eye, which had hitherto remained quiet, suddenly flared up and neurectomy of the optic and ciliary nerves was performed, 15 mm. of the optic nerve being removed. But a year and a half afterwards the right eye showed marked irritation and the left had to be excised. No bacteria were found either in the globe or in the resected portion of nerve. The ciliary nerves also were normal.

Schirmer, in his elaborate study of the pathogenesis of sympathetic ophthalmia, does not accept these two cases as definitely overthrowing the migration theory, because the exact condition of the central and distal nerve ends was not ascertained in the first weeks and months after the

operation. His own experiments on animals, by which he hoped to find out whether micro-organisms passed from the globe to the distal end of the nerve after resection, he admits to be unsatisfactory, and it becomes, therefore, a matter of great importance to know exactly what happens to the cut ends of the nerve after neurectomy has been performed.

If, as some maintain, a connecting band of tissue forms very rapidly between the two cut ends of the nerve, and if, further, bacteria can pass along such a connecting band, then the inefficacy of neurectomy in preventing sympathetic ophthalmia may easily be explained.

Deutschmann tried to determine the point by performing neurectomy on rabbits and examining the parts at different intervals of time after the operation. Six rabbits were treated in this way, from 2 to 5 mm. being removed from the nerve. The time allowed to elapse before he killed the animals was different in each instance, four days, seven days, three weeks, a month, two months, and eight months being the respective intervals.

Immediately before or just after death he made an opening into the skull over the cerebrum, and injected a quantity of Chinese ink suspended in water into the arachnoid space. Subsequent examination of the divided nerve showed that in all cases, except in the case of the rabbit killed on the fourth day, there was a well-defined band of connective tissue connecting the two ends of the divided optic nerve, and also that the space between the two ends had been materially diminished. The microscopical examination proved the connecting band, even after eight months, to be very delicate; it contained many nuclei and carried blood-vessels, and could easily be differentiated from the orbital tissue; here and there, also, a suggestion of an endothelial lining was present. The cut ends of the nerve were not united by scar tissue, so that there was nothing to prevent the injected solution passing freely from one portion of nerve to the other. When the stain reached the proximal end of the divided nerve, it did not spread diffusely into the orbital tissue,

but passed along the connecting band to the distal end, and so into the papilla. Isolated particles, of course, did find their way into the orbital tissue, but not to any great extent.

Arguing from these conclusions, Deutschmann maintained that communication between the central and distal ends of the nerve was kept up by means of the newly-formed connecting band, and that bacteria, therefore, might freely pass along the whole course of the nerve, even after neurectomy had been carefully performed.

Our author has carried out a fresh set of similar experiments, also on rabbits, but his results are, in all essential features, the reverse of those found by Deutschmann, and he therefore describes them in full.

He did the operation just as Deutschmann had done it; the conjunctiva was raised from the globe over the superior rectus, the muscle severed from the sclera, and the optic nerve caught by a strabismus hook. The eye was then turned downwards and the nerve divided as far back from the globe as possible. Then, by rotating the globe forwards, the stump of nerve attached to it was seized and divided close to the sclera. The eye was replaced, and the conjunctival wound sutured.

The wounds all healed without difficulty, but in one instance phthisis bulbi afterwards occurred. Considering the shrunken condition of the globe in this case and its altered relations to the orbit, Velhagen has thought it wise to exclude it from the list of his published results. As well as Chinese ink he used a solution of Berlin blue, which he thought might pass through the lymph channels more freely than the other. The rabbits were killed at about the same intervals after the operation as in Deutschmann's experiments.

Experiment No. 1.—Three mm. of the left optic nerve of a rabbit were removed on June 3, 1893. Immediately after the operation the pupil was contracted. No changes could be made out with the ophthalmoscope.

On June 15 the only remaining trace of the operation was the conjunctival scar. The retinal vessels were a little narrower than those of the other eye.

After the lapse of three months the disc and nerve fibres were glazed and white, and the vessels exceedingly narrow. There was marked retinitis pigmentosa above the disc, the pigmented area being wedge-shaped, with the apex pointing towards the disc. Cornea clear, pupil wide and inactive; there was no alteration in the shape of the globe.

The rabbit was at this date killed with ether, the skull opened near the middle of the left cerebral lobe, and about $2\frac{1}{2}$ drachms of Berlin blue solution injected with a steady and gentle pressure into the subdural space. The cord was exposed at its lower end, so that the distribution of the solution might be accurately watched, and it was found, as under the circumstances might be expected, that the arachnoid space was tensely filled.

After hardening in absolute alcohol the specimen was examined macroscopically. There was very little difference between the two optic nerves near the chiasma, so far as naked eye appearances went. They were of the same size, and each was tinted a light blue. The central end of the *left* nerve was more than 3 mm. distant from the papilla. The stain had made its way to the conical end of the nerve stump, but there was no appearance of stain in the orbital tissue. The specimen was cut in two at the commissure and both halves embedded in celloidin.

Microscopical examination four weeks later showed in the *right* (untouched) eye a delicate blue stripe surrounding the nerve which extended as far as the disc. There was no stain in the neighbouring fat. The subvaginal space was densely injected. Tenon's space contained no stain, but the supra-choroidal space was filled almost to the equator of the globe. The fluid had penetrated at the papilla between the sclera and choroid, and at the point of entrance of the nerve into the sclera the staining was so intense and so diffused that histological minutiæ could not be made out. The peri-vascular spaces round the venæ vorticosæ were not infiltrated with the injected fluid.

In the *left* eye, there was absolutely no trace of the Berlin blue in the orbit, but the stain was present in large quantity

in the central nerve stump. It had even caused the dense sheath to bulge a little, but had not been able to penetrate beyond the scar. The nerve sheath gradually became merged in fibrous scar tissue, the contraction of this tissue no doubt accounting for the conical shape of the stump. The scar tissue contained abundant nuclei. Near the nerve stump the band of cicatricial tissue divided into several small branches. The middle and largest one rapidly tapered down, and became lost in the orbital fat when it had covered about a third of the distance to the sclerotic; another was inserted into the adventitia of a large vessel.

There are records of eight other experiments by Velhagen, all performed almost precisely in the same way, and as the results are practically identical with those just described we pass on to briefly summarise the conclusions which he draws from his investigations.

In the cases where the rabbit was allowed to live five, seven, fourteen and twenty-two weeks after the neurectomy, none of the injected fluid had escaped into the orbital tissues from the central stump of the optic nerve. Some staining fluid, however, was found in the orbit in those cases where only three to fourteen days elapsed between the operation and the death of the animal. This, of course, clearly indicates that the nerve-end cannot be firmly closed by scar tissue until some time after the neurectomy. This interval Velhagen puts as varying from two to five weeks. After that time fluid injected into the subdural space will not pass through the cicatricial tissue, even if the pressure exerted is somewhat above that of the cerebro-spinal fluid under normal conditions.

The scar tissue was, anatomically, very much the same in all the cases. It consisted of ordinary fibrous connective tissue with some nuclei, and was divided into separate bands, which varied in thickness and length; these were attached wherever the parts had been torn or wounded by the operation. There was little difference noted between the cicatrix of seven weeks' and that of six months' duration. The scar carried only a few blood-vessels, this being demon-

strable not only by the microscopic sections but also in one case where the vessels were injected from the aorta.

The distance between the two cut surfaces of the nerve was never less than the size of the piece removed, and in several instances was even larger. In no single instance was there any indication of an attempt on the part of the newly-formed tissue to connect the two cut surfaces together.

There was no endothelial lining to the bands of cicatricial tissue, nor newly-formed lymph spaces in connection with them.

In those cases in which the staining fluid was injected soon after the operation, so that it might penetrate beyond the central stump, it was found to be diffused into the orbital fat, and even where a large quantity had been used none of it reached the region of the disc.

The author draws special attention to the fact that the supra-choroidal spaces of the uninjured eye were in most of his experiments filled with the injected fluid, as other investigators, Schwalbe for instance, could not succeed in injecting this space from the brain.

The paper concludes with a final word on the bearing of these experiments on Deutschmann's migration theory. If Velhagen's observations are correct, and if the formation of scar tissue in man is the same as in the rabbit, then certainly it is difficult to see how micro-organisms could bridge over the space between the divided nerve-ends and so travel round to the other eye after the lapse of thirteen weeks much less after eighteen months, the intervals in the two cases to which reference has been made in the early part of this paper.

N. M. ML.

H. PARINAUD (Paris). On Œdematous Neuritis of Intracranial Origin. *Annales d'Oculistique, July,* 1896.

The article before us is one of considerable importance. In it, Parinaud subjects to a searching criticism the various theories by which the occurence of papillitis with cerebral disease has been explained, and with much cogency re-advocates certain views which he first put forward sixteen years ago.

1. Is papillitis the evidence of an inflammatory process beginning within the cranium and extending by direct continuity of tissue to the eye? This view is untenable. It is refuted by the fact that the exciting cause is often an intra-cranial tumour, far removed from the cerebral extensions of the visual apparatus, and that continuity of inflammatory changes is not to be found.

2. Equally untenable, in the light of many experiments, is the theory which ascribes the papillitis to vascular stasis within the skull.

3. The theory which attributes the papillitis to increase of pressure within the skull was based on the fact that there is very frequently a dropsical distension of the optic nerve-sheath. The high pressure was supposed to drive the fluid along the sheath and thence into the substance of the nerve, causing swelling of the cribriform fascia and strangulation of the papilla. An excess of pressure within the skull is certainly present in some cases, but does not appear to be capable by itself of producing neuritis. Parinaud here adduces certain experiments of his own, in which, with the aid of a column of mercury, he induced high intra-cranial pressure in animals. Not only was he unable to produce neuritis, but even the vascular changes, described by some other experimenters, were absent. He holds that, when dilatation of the retinal vessels occurs, under such circumstances, it is due to some other influence than the compression. Moreover, he doubts whether any prolonged excess of pressure within the skull is compatible

with life; in the rabbit a pressure of 6 centimetres of mercury, in the dog of 10 centimetres, cannot be exceeded. The growth of a tumour within the cranial cavity does not necessarily raise the intra-cranial pressure, for the latter is regulated by a diminution of the cerebro-spinal fluid. When such regulation fails hydrocephalus results. Hydrocephalus is a frequent cause of optic neuritis, but is not constantly present. Papillitis is due, according to Parinaud, rather to an œdema of the brain substance, and an extension of it along the nerve, than to the direct influence of increased pressure, hence the failure to produce papillitis experimentally by making high pressure in the skull; one can effect an excess of pressure artificially, but not an œdema of the brain.

4. To meet the difficulties which surround the pressure theory, Leber advanced the idea of an infective process, and Deutschmann brought to its support a series of experimental observations. But the nerve inflammation which Deutschmann induced by the injection of infective material, differs considerably from optic neuritis as we see it clinically. The artificial neuritis leads in a few weeks to atrophy, while the clinical form may co-exist for long periods with good vision, may remain for months before atrophy sets in, and may disappear completely when the cause is removed. But the strongest argument against the infective theory is the fact that infective diseases of the brain, such as syphilis, tubercle, and abscess, are accompanied by neuritis less constantly than are tumours of the brain. The eye offers an admirable field for observing the difference in the amount of irritation produced by these two classes of disease. While gummata, tubercular masses, and purulent formations are always accompanied by the signs of inflammation, the growth of a tumour is usually quite free from such signs until glaucoma supervenes. Yet it is the quiescent growth, and not the infective process, which most constantly induces papillitis. Again, the now numerous cases in which the operation of trephining has caused a retrocession of the papillitis, afford an argument against the theory of an infection of the

papilla by material transmitted to it from the brain, for it appears to be the opening of the cranium and escape of the cerebro-spinal fluid, sometimes with drainage of the ventricles, rather than the ablation of the tumour itself, which relieves the œdema of the papilla. In short, there appears to be a wide difference between the œdema of the papilla, which leaves the visual function long intact, and which can subside completely under the influence of trephining and drainage of the cranium, and the neuritis which is primarily inflammatory, and is accompanied with disturbance of vision from the commencement. Deutschmann succeeded in causing a papillitis by injecting tubercular material into the skull, but he did not prove a transmission of the infective material to the papilla. Parinaud cites the recent microscopic researches of Rochon-Duvigneaud, as showing that the changes which papillitis induces in the nerve are not those of a microbic inflammation.

Parinaud describes the nature of the process as follows: —Optic neuritis of intra-cranial origin is primarily a lymphatic œdema of the nerve. It is caused by the same influences and the same mechanism as œdema of the cerebral substance, of which the optic nerve may be regarded as a prolongation into the orbit. It is usually associated with hydrocephalus and with an increase of pressure within the skull, but dropsy of the ventricles is not necessarily present, and increased pressure within the skull is not of itself sufficient to induce papillitis. The œdema of the nerve does not imply a great excess of intra-cranial pressure, or a mechanical propulsion of intra-cranial fluid into it. The distension of the nerve sheath is a concomitant, but not a cause of the neural œdema. The scleral ring favours strangulation of the papilla like a ligature around an œdematous extremity. The condition may properly be designated an œdematous neuritis. The inflammatory tissue-changes which are to be found at a certain stage of the process are of the same nature as those which result from œdema in other parts of the body, and are due to the prolonged presence of the serous effusion in

the tissues. The modern idea of inflammation is that whenever the vitality of the tissues is compromised by any cause whatever, whether this be the action of microbes or their toxines, organic or inorganic poisons, physical agents or injuries, a reaction occurs, the object of which is either to repair the tissues or to replace them by others. There is, therefore, no difficulty in understanding how an inflammatory process may originate in the retention and non-renewal of an organic liquid in the tissues. Œdema of lymphatic origin, moreover, appears to lead more rapidly to inflammation than does œdema caused by disturbance of the blood vessels. The eye itself, says Rochon-Duvigneaud, offers a striking example of such transformation in acute glaucoma, a condition with which microbes have nothing to do. (It may be added that the outpouring of serous fluid beneath the retina in presence of a choroidal sarcoma, affords a further analogy with the œdematous process which Parinaud describes.)

The histological changes in the cases in question predominate in the papilla and in the intra-cranial portions of the nerve, and are less pronounced in the orbital portion. In some cases the optic tracts and chiasma are affected in like manner. These differences, difficult of explanation by the microbic theory, are easily accounted for when the whole process is regarded as essentially an œdema. The tissue changes are greatest where the œdema is greatest. The orbital portion of the nerve is supported by its internal sheath as an œdematous limb is supported by a compressive bandage. Where this support is absent, and where the scleral ring forms a tight constriction, the œdema reaches its height. Lastly, Parinaud suggests that a similar condition of œdema will be found, if looked for, in other parts, as in the orbital nerve, where the conditions are favourable to strangulation.

P. S.

H. GIFFORD (Omaha). The Pneumococcus of Fraenkel as a frequent Cause of Acute Catarrhal Conjunctivitis. *Archives of Ophthalmol.*, *xxv.*, 3.

This paper gives an account of Gifford's investigations into the cause of acute catarrhal conjunctivitis in Omaha and its immediate vicinity. His results do not correspond with those of Weeks, who studied the etiology of the disease as it occurred in New York.

His investigations on the subject have extended over a period of eight years, but the number of cases actually observed is small—about forty only—as in his neighbourhood such maladies comparatively seldom come under the notice of the specialist. It should be added, however, that in nearly every instance the cases he saw were not isolated examples of the disease, but specimens of small epidemics, so that the forty actually observed really represent a much larger number—Gifford puts it at about two hundred—in which the etiology was the same.

In thirty-six of the forty cases, microscopic examination of the discharge revealed, not the bacillus of Weeks, but the pneumococcus of Fraenkel (diplococcus lanceolatus), and cultures on serum and agar-serum which the writer made from twelve of these cases showed the same germ, almost always in a pure state. Further, Gifford has transmitted the disease from eye to eye (in man) by means of the discharge, and in the discharge of the eye thus infected the pneumococcus was almost exclusively present; finally, with pure cultures of the third generation he has caused the same disease, also in man, and so, as he says, completed the chain of evidence required to establish the pneumococcus as the exciting cause.

Morax,[1] Parinaud,[2] and Gasparini,[3] all refer to cases of catarrhal conjunctivitis mostly in young children, where Fraenkel's pneumococcus was discovered and considered the probable exciting cause of the attack.

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[1] *Thèse de Paris*, 1894.
[2] *Annales d'Oculistique*, December, 1894.
[3] *Annali di Ottolmologia*, xxiii., 6.

None of these authors refer to any attempt to convey the disease from man to man, or to cause catarrhal conjunctivitis in man or the lower animals, but Axenfeld in a recent paper,[1] refers to a school epidemic of pneumococcus conjunctivitis and notes unsuccessful attempts to transmit the disease to the human eye either with the secretion from the infected lids, or with cultures of the micro-organism. He thinks the affection is one almost exclusively of children, and that although the clinical evidence seems to point to the disease being contagious, it is just possible that, owing to some conditions not properly understood, many patients are independently attacked at the same time.

Our author's experiments seem to refute these suggestions and clearly establish the contagiousness of the affection; this is a definite step onwards, because, although few people, we presume, doubted its contagious qualities, yet attempts to transmit it by pure cultures had hitherto failed, and even the possibility of direct infection from man to man had not been proved.

Experiment I.—J. C., a boy aged 10, was brought to the author suffering from typical acute catarrhal conjunctivitis.

With a platinum wire Gifford took a small portion of the discharge from the lower *cul-de-sac* and inserted it on the outer part of his own eye. Next morning his eye was a little uncomfortable, but soon got easy again, and nothing further was noticed till the following morning (*i.e.*, forty-eight hours from infection), when the lids were swollen and gummed together, ocular and palpebral conjunctiva much congested, and discharge profuse. These signs increased in severity for twenty-four hours more, and then gradually subsided, till in three days they had disappeared.

Under the microscope the discharge showed numerous pneumococci, and a pure, though not very abundant

[1] Reported in *Centralblatt für Augenheilk.*, February, 1896.

growth of the micro-organism was obtained in cultures made on $\frac{1}{2}$ per cent. agar.

Experiment II.—This was simply a further step in the same method of investigation. A little of the discharge taken from Gifford's own eye was introduced into the conjunctival sac of his assistant, with the result that after forty-eight hours (the same incubation period as in Gifford's case), a catarrhal conjunctivitis was set up. The symptoms were considerably milder than in the preceding case, and subsided even more quickly. No cultures were made from this eye, but the pneumococcus was discovered in the discharge, although not very abundantly.

The author goes on to say that one attack seems to confer a certain immunity, for he has twice since tried to inoculate his own (the same) eye with the discharge, but on neither occasion was he successful; this immunity is, however, by no means invariable.

Experiment III.—After many failures Gifford succeeded in inoculating the disease with pure culture in the following manner. He made an anaerobic culture of the third generation by Büchner's method on serum-agar, and after twenty-four hours there was a very thick deposit of the germs in the condensation water. A little of this was removed with a sterilised pipette, and two drops instilled into the eye of a man aged 23, whose conjunctiva was normal; twenty-two hours later there was a typical acute catarrhal conjunctivitis with numerous pneumococci, but no other germs in the secretions. The inflammatory condition abated somewhat after the second day but then again increased in intensity, so that by the eighth day it was as acute as ever. The secretion was on this day again examined and enormous quantities of the pneumococcus discovered; these grew in a pure culture on serum-agar. In the course of this patient's attack he communicated the disease to his nephew, a child of 19 months, with whom he had been playing, and the discharge from the child's eye also contained the pneumococcus in pure culture.

Experiment IV. was a repetition of the last, except that only one drop of the condensation water was instilled into

the eye. The patient was a woman of 43, whose conjunctiva was rather hyperæmic, she having had an acute attack of trachoma about a year previously. The pneumococci in this case were rather fewer than in the other, and there were many staphylococci as well. The culture showed colonies of the pneumococcus, but more numerous ones of the staphylococcus albus.

Generally speaking, says the author, the more pronounced the symptoms the more abundant the pneumococci in the discharge. When the inflammation begins to subside, either with or without treatment, the pneumococci rapidly diminish, so that towards the end of the attack they are often very difficult if not impossible to discover.

As regards the period of incubation, Gifford's investigations would seem to indicate that while the average length of the incubation period is about forty-eight hours, it varies with the quantity and virulence of the germs introduced.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

E. Nettleship, F.R.C.S., President, in the Chair.

Thursday, October 15, 1896.

Cataract Extraction in an Albino.—Read by Dr. Arthur Sandford (Cork). The patient was an unmarried woman, aged 60, with all the appearances and symptoms of albinism, except nystagmus. Before operating on this case he was anxious to obtain some reference indicating the possible influence of the congenital condition upon the success of the operation, but could find no similar case recorded. He extracted the left cataract with a narrow iridectomy; the operation and the subsequent progress of the case were satisfactory, except that there was considerable hæmor-

rhage into the anterior chamber from the cut surface of the iris. This continued for about ten days, and seemed to be connected with the morbid condition. Ergot and iron were administered. The patient recovered excellent vision with glasses (V. = $\frac{6}{9}$, reads 4 J.). In future he would omit iridectomy in similar cases.

The President had operated on one albino ; the case did very well surgically.

Dr. Drake-Brockman had operated on a Hindu albino; there were no complications, and the case did very well.

Oxygen Gas in Suppurative Conditions of the Cornea.—Dr. Sandford (Cork) read this paper. He had treated several cases of corneal and conjunctival affections by oxygen gas after the manner used successfully by Dr. George Stoker for wounds and chronic ulcers. As to the ultimate value of this treatment in ophthalmic work, the time was too short and the cases too few to justify a definite opinion, but from what he had seen he was sanguine as to its usefulness. The cases in which marked benefit had accrued, included superficial spreading ulcerative keratitis, ulcer of cornea with hypopyon, and muco-purulent conjunctivitis. The obvious advantage seemed to be that where there was photophobia with discharge the patient was enabled to keep his eyes open, since light was excluded by the rubber cap containing the oxygen gas, and the eyeball was kept constantly in a pure atmosphere, which had been proved to be inimical to noxious germs, and favourable to healing processes. His object in bringing the subject forward thus early, whilst still in the experimental stage, was that some of those present might be induced to give the treatment a fair trial, and to record their experiences, favourable or otherwise.

Mr. Treacher Collins had seen this treatment used in one case of ulcer of the cornea in a child. A rapid recovery followed, but this might have been due to other causes, as hospital care, food, &c.

Hereditary or Congenital Optic Atrophy and Allied Cases.—Mr. Simeon Snell (Sheffield) read this paper. He con-

tributed 16 cases in which both eyes were affected. They ranged themselves into three groups. (1) This group consisted of a family in which 5 out of 8 children (3 sons and 2 daughters) were amblyopic. The patients when first seen were all adults, their ages ranging from 21 to 32. The condition in all was apparently congenital, and had undergone no alteration. The field of vision showed no peripheral contraction. Colour blindness was present in 4 of the 5 cases, and a brother with normal sight was also colour blind. (2) This group comprised 8 cases, namely, 2 brothers who became affected when about 17 years old; 2 brothers who became affected at about 20 and 24; a young man affected at 25, cousin to the last-named brothers; and in another family 2 brothers and 1 sister, the amblyopia in each case coming on at the age of 13 to 16. These cases belonged more strictly to the class described by Leber as hereditary optic atrophy. Headache was a symptom, and epileptic attacks were present in two instances. A central scotoma was present in some of the cases, and in some also there was contraction of the periphery of the field. The exciting cause was not evident. In one vision failed shortly after marriage. (3) In this group were 3 brothers—smokers. A similar series had been related by Mr. Edgar Browne. The affection showed itself at different ages, namely, 52, 49 and 35. The cases were observed from eight to ten years ago, and the condition has remained permanent, the best having now V. $= \frac{5}{200}$ in each eye. In each case there is peripheral contraction of the field and a central scotoma.

The President said that the distinctions between the different kinds of family blindness were very useful, and should be made the most of. All the cases were not hereditary optic atrophy as described by Leber; he had met with dyschromatopsia and amblyopia in several members of a family whose sight remained stationary; they could all see better in dim light.

Dr. Habershon said that there were differences between the cases. Those which occurred in smokers in a family showed that the members of that family were not able to

resist the action of tobacco. He thought that the cases in Mr. Snell's first group were more of the nature of retinitis pigmentosa with night blindness.

Herpes Ophthalmicus occurring shortly after Extraction of Cataract.—The case was narrated by Mr. Snell (Sheffield). It was interesting from the fact that a severe attack of herpes ophthalmicus occurred in a woman, aged 75, seven days after extraction of cataract without iridectomy on the same side as the eye operated upon. In addition to the forehead, the side of the nose and upper eyelid were affected, but a slightly delayed recovery from the operation was the only effect on the eye.

Central Amblyopia as an Early Symptom in Tumour at the Chiasma.—This paper was read by the President. He had seen about ten cases in which failure of vision at or near the centre of the field in both eyes, with little or no early ophthalmoscopic change occurred in women. Three of them turned out to be cases of ordinary tobacco amblyopia, and in one it seemed probable that alcohol was the cause. Some five cases remained in which there was no reason to suspect a toxic cause, and in which later events made it probable that coarse intra-cranial disease had caused the visual failure. Three of these patients had died with cerebral symptoms, and in the fourth a *post-mortem* examination revealed a cystic tumour involving the chiasma, optic tracts, and other parts at the base of the brain. The loss of central field in the earlier stages was more abruptly defined, and less constant in position than in tobacco amblyopia, and the symmetry was less precise both in time and degree than in the latter disease. In a later stage there was mental failure, loss of memory, and irritability, with occasional headache and varying paralysis of one or more ocular muscles. The changes at the disc at most only amounted to pallor of the outer half until a late stage of the disease. If these cases be seen at an advanced stage, the visual field will often have the form of a temporal hemianopia. The case in which he had obtained a *post-mortem* examination was that of a lady whose sight had failed while she was

suckling her fourth baby. She had a black spot before the left eye, and later, before the right. There was a central scotoma of oval shape beginning just outside the fixation point, and extending about twenty degrees outwards. There was no peripheral loss of fields. Her vision and mental condition got worse, and she died after about three years. At the *post-mortem* examination, the brain was a good deal flattened on both sides. At the base there was a large membranous sac filled with fluid, lying on the *sella turcica*, and extending forwards to the cribriform plate of the ethmoid. The wall of the cyst was loosely attached to the hinder part of the frontal lobe, to the median part of the temporo-sphenoidal lobe, and to the hook of the uncinate convolution; it reached back as far as the middle of the pons. The chiasma was incorporated in the front wall of the cyst; the right optic tract could be traced back to the pulvinar; the commissural fibres could be followed a short distance towards the other side, as also the fibres which pass to the cerebrum. The left optic tract could not be found; it was so flattened as to be unrecognisable.

Card Specimens. — The following were shown:— Mr. Treacher Collins: Disseminated White Patches in the Choroid with Cholesterin Crystals on the Surface.—Mr. Marcus Gunn: Result of Iridectomy for Chronic Glaucoma.

REMOVAL OF A SPICULUM OF GLASS FROM THE VITREOUS WITH PRESERVATION OF NORMAL VISION.

By M. H. Post, M.D., St. Louis, U.S.A.

E. H., a young man of 17, while working in a chemical laboratory, was, on September 20, 1895, injured by the explosion of a flask containing *aqua ammoniæ,* particles of glass striking him in the face and eyes. He was seen shortly afterwards by Dr. J. P. Soliss, of Olney, Illinois, who found a cut in the left cornea, and a dark line in the iris corresponding with the corneal wound; an ophthalmoscopic examination, made by Dr. Soliss, showed the fundus to be normal. Solutions of atropia and of zinc were used. In the beginning there was but little pain. When brought to St. Louis, seven days after the injury of the eye, there was marked ciliary injection with paroxysms of severe pain. Vision of uninjured (right) eye $\frac{20}{12}$; vision of injured (left) eye $\frac{20}{19}$. The ophthalmoscope showed a hole through the iris, to the nasal side, and immediately behind this a foreign body, looking like a spiculum of glass, embedded in the lens and projecting downwards and backwards into the vitreous. With some hesitancy it was decided to attempt to remove the glass instead of at once enucleating the eye.

A large incision was made through the sclero-corneal margin at the nasal side, with a Graefe's cataract knife, the middle of the cut being placed

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opposite the wound in the iris, and a large piece of the iris was removed, including the injured portion. An old-fashioned Critchett cataract scoop, shaped something like a slipper, was passed directly back through the zonule of Zinn, and well into the vitreous. Inclining the handle of the instrument toward the median line of the face, the toe of the scoop was made to sweep outward and forwards towards the centre of the cornea, to the point where it was supposed that the inner extremity of the piece of glass was situated, in order that it might become engaged in the little pocket at the end of the scoop.

The foreign body was secured at the first attempt; it proved to be a spiculum of glass 9 mm. in length. In the course of the operation the lens was pretty thoroughly broken up and a considerable portion of it removed.

The eye was dressed antiseptically with absorbent cotton, held in place by gauze and fastened to the face and forehead with collodion. The eye was cared for as after an ordinary cataract extraction. Healing progressed uneventfully, and by December 1 the patient was able to resume his studies. On December 29, the last time he was seen, vision in the injured eye was $\frac{20}{15}$, with a proper correcting glass. Since then he has completed his school year with high honour, his eye giving him no further trouble.

KATZ (Heidelberg). The Association of Optic Neuritis and Acute Spinal Myelitis. *Archiv. für Ophthal. Bd. xlii., Abth.* 1.

The rarity of cases of coincident inflammation of the optic nerves and spinal cord, has led the author of this paper, to publish notes of a case observed in the University Clinique in Heidelberg. He follows this by a brief *resumé* of the previously published records, the total number being twenty-one. He then analyses this series of cases, in the hope of obtaining some definite information as to the nature and causation of the myelitis and the optic neuritis, and more especially as to the reason and meaning of their association. In this endeavour he has not been very successful, and the value of his paper is in the main a negative one, in that he adduces evidence that of the several theories put forward to explain the coincidence of acute optic nerve and spinal cord inflammation, some are not worthy of credence.

Katz's case was that of a married woman, 56 years of age, who came to the hospital on February 13, 1894, and remained under observation till her death in March, 1895. She gave a history of venereal disease (infection by her husband), but there was no certain evidence of syphilis. She had had one pregnancy ending in abortion. Her husband died of tubercle. She has for long been subject to attacks of great weakness, so that she could hardly stand alone; these always occurred in the spring.

When first seen vision was R. $\frac{6}{18}$, L. $\frac{6}{36}$, with correction of some hypermetropic astigmatism. Colour vision normal, fields of vision unrestricted. Ophthalmoscopic examination showed slight but definite papillitis. Three days later she was taken into hospital; visual acuity had fallen in each eye, but more in left; the right eye showed no abnormality of the field of vision; no colour defect; the left eye had an unequally contracted field, and complete colour blindness. No signs of disease in abdominal or thoracic viscera. No albuminuria.

February 18.—Vision has still further deteriorated. There

is defective sensation on right side, and mental disturbance, forgetfulness, agitation.

February 24.—Paresis of left leg.

February 25.—Retention of urine ; onset of delirium.

February 26.—Complete paralysis of left leg, paresis of left arm ; right leg can be moved with effort, foot and toes freely movable. Anæsthesia and analgesia of left side of abdomen and back, as high as tenth rib ; on right side sensitiveness diminished but not abolished. Headache, especially in right temporal region. Albuminuria. This condition was followed by paræsthesia of upper extremities and face, and later by paræsthesia and convulsive movement of lower limbs. Retention of urine and subsequently incontinence. The signs of optic neuritis became more marked ; vision was completely lost from February 19 to March 8, when perception of light was regained. Slow improvement of sight occurred till April 24, when with R. patient could count fingers barely in lower part of field, and with L. she could count fingers correctly at two metres. The swelling of the optic papillæ had partially subsided, the discs had a bluish-white appearance, and the retinal arteries were narrower in left than in right.

There was comparatively little change from this date ; vision became rather worse again. Death occurred on March 7, 1895, and a *post-mortem* examination was made twelve hours later.

The brain showed no naked eye change beyond slight œdema of the *pia mater*. The spinal cord was unusually soft in its whole length, but especially in the dorsal region where it was small and smooth, the surface markings being almost lost. In the lower part of the lumbar enlargement there were depressions in the cord on each side in the position of the pyramidal tracts ; higher up they appeared greyish yellow in colour and slightly prominent. Similar changes were present in the posterior columns passing up towards the cervical portion. In the cervical enlargement the markings of the right half of a cross section were entirely obliterated ; in the left half the anterior and posterior horns were plainly visible.

The optic chiasma and nerves were atrophied, and on microscopic examination showed signs of inflammation. The outer sheath of the optic nerve was normal, the inner sheath thickened, with some hypernucleation; there was slight increase of the connective tissue septa in the nerve, and degeneration of the myelin sheath of the nerve fibres. Here and there whole nerve bundles were replaced by brownish degenerate tissues.

Among other pathological changes were emphysema and œdema of lungs, dilatation of right side of heart, and some fatty degeneration, enlargement of spleen, interstitial nephritis.

Abstracts of cases of acute spinal myelitis and optic neuritis, recorded by Erb and Steffan, Noyes, Seguin, Rumpf, Chisolm, Schluter, Dreschfeld (3 cases), Sharkey, Knapp, Achard and Guinon, Eskridge, Mahokian, Elschnig (5 cases), and Schanz, are given by the writer, and his subsequent comments and deductions are based upon his analysis of the whole number inclusive of his own case.

In most of the cases the early history is that of rapid failure of vision, generally bilateral, in an apparently healthy person, and it is this symptom which brings them under observation. In 13 out of the 21 cases the failure was preceded by severe frontal or hemicranial pain.

In only two instances has there been recognisable affection of other cranial nerves; in one there was paresis of third, sixth, and facial nerves; in another, rotation of the eyeballs upwards was defective (this is not good evidence of affection of 3rd nerve).

In one patient complete blindness ensued in 24 hours, but usually several days elapse before this stage is reached. In one case the greatest degree of failure occurred after five months, and in another after nine months, and in these instances total blindess did not follow.

In 19 cases both eyes were affected, and 26 eyes of this number became absolutely blind; in 4 cases there was gross defect of one eye and complete loss of vision in the other.

Slight failure of vision in both eyes was noted in 4 cases;

in one instance there was failure of vision when the optic neuritis was discovered by ophthalmoscopic examination.

In 9 cases the optic discs passed into a condition of white atrophy; in 9 the disease terminated fatally while optic neuritis was still present. In only one instance was there restoration of vision and of normal ophthalmoscopic appearances.

The spinal myelitis, in the cases in which its position is stated, was in a large majority in the lumbar and dorsal regions; the cervical portion of the cord was seldom affected.

What is the connection between the two widely separated lesions, the myelitis and optic neuritis? In seeking an answer to this query, Katz makes use of the facts brought out in his analysis of the cases, as corroborating or discrediting the theories already put forward. He concludes that the view which considers the optic neuritis directly dependent upon the spinal cord disease, by means of vaso-motor disturbance is untenable.

The theory that the optic nerve inflammation is the result of an ascending meningitis, starting from the diseased area in the cord, is also thought by the author to be inadequate, although in some of the cases there has been *post-mortem* evidence of cerebral meningitis. It is noted, however, that in some of the *post-mortem* records no mention is made as to the condition of the cerebral meninges. Among the clinical facts which militate against the ascending meningitis theory, one of the most convincing is the earlier onset of the optic neuritis. In 15 out of 21 cases, the optic neuritis was known to precede any symptoms of spinal myelitis, the difference in time varying from three days to five months.

In five instances the two conditions are said to have developed simultaneously, and once the optic neuritis appeared four or five weeks later than the spinal cord lesion.

If, as seems most probable, the concomitance of myelitis and optic neuritis is the result of some unknown poison, acting simultaneously or at short intervals, upon two distant parts of the nervous system, it becomes a matter of importance to determine the nature of the noxious agent.

In respect of this, Katz says, the results of investigation are meagre. In the 21 analysed cases, syphilis was ex-excluded in 10, in 6 there was no statement, and in 5 there was proof of it. The evidence as to renal disease, before the onset of spinal symptoms, is, in the majority of cases, negative.

The common cause of the two lesions, which, from the collected evidence, would seem to arise independently of each other. remains undetermined, and this view, that a common cause exists, cannot be considered proved, although there is less difficulty in its acceptance than applies to the other theories.

J. B. L.

CASEY A. WOOD (Chicago). A Case of Pigmentation of the Cornea. *Annals of Ophthalmology and Otology*, 1896. *No.* 2.

Wood, with a report of a case of this rare condition, gives some account of five cases previously reported by other observers. His case occurred in a man of 56 years, who had always been near-sighted, and who came for acute glaucoma, the condition having first become painful two months before. His vision was reduced in the affected eye (the left) to counting fingers at four feet. The tension was + T 2, ànterior chamber shallow, pupil semi-dilated and motionless, with several small posterior synechiæ. The cornea was hazy and infiltrated. At the centre there was diffuse interstitial infiltration, and a punctate keratitis with the dots arranged in the usual pyramidal fashion, the base being intersected by fine vessels, and the apex—where the spots were few and thin—reaching almost to the centre of the cornea. No vessels advanced into the cornea more than 2 or 3 mm. from the limbus.

After a peripheral iridectomy upward, the anterior chamber was left filled with blood, but the symptoms of glaucoma disappeared and the eye rapidly became quiet. At the end of six weeks V. = $\frac{20}{70}$, with field greatly narrowed. The cornea was less hazy, but the lens was rapidly becoming opaque, having been injured apparently in tearing away the iris.

One week later a rounded mass of pigment, 1 mm. broad, was noticed near the centre of the cornea. Near this were smaller scattered deposits, below these a band of perfectly clear cornea 2 mm. wide; and below this an area with fine dots, which near the corneo-scleral junction appeared to be undergoing pigmentation. The lowest part of the cornea was hazy, and contained capillary vessels running into or past medium-sized dots in all stages of pigmentation—some whitish, some greyish, and some jet black. At the end of three months a part of the diffuse interpunctate haze had disappeared, leaving transparent cornea in which were planted black dots, chains and irregular figures. The pigmentation seemed to be mainly in the dotted deposits on the membrane of Descemet.

Wood thinks that, although pigmentation is an exceedingly rare occurrence, there seems no reason why it should not take place oftener. Although the cornea has no blood-vessels, and although in only one of the previously recorded cases were vascular new growths in the parenchyma found, pigmentation occurs in other non-vascular tissues. Migratory white corpuscles may carry hæmatin many millimetres from the vessel which normally held them; and when intraocular tension is marked, and an acute inflammatory process is going on, the diapedesis of red corpuscles into and about the corneal lymph channels is probably easy, both from a blood collection in the anterior chamber and from the vessels of the corneal limbus. In the majority of recorded cases there was persistent increased intraocular tension, bleeding into the anterior chamber, brownish, smoky, or other discolouration of the central area of the cornea, and pigmentation at the limbus and in other parts of the anterior segment of the eye-ball.

E. J.

C. R. HOLMES (Cincinnati). The Sphenoidal Cavity and its Relation to the Eye. *Arch. of Ophthalmology, vol. xxv., p.* 460.

At the outset the author explains that he has been forcibly struck with the fact that the measurements of the sphenoidal air cells and the relations of the ostium sphenoidale are not very clearly understood; the paper is announced as accompanied by ten illustrations, and tabulated measurements of fifty specimens. By some mistake the table is missing, but it is promised with additional remarks in a later number.

The especial points upon which Holmes insists are :—

(1) That the ostium sphenoidale is situated on a plane above the posterior end of the middle turbinated bone ; on an average the distance is 12 mm., the range being from a minimum of 7 mm. to a maximum of 16 mm.

(2) That the sphenoidal opening, variable in shape, communicates with the nasal cavity in the spheno-ethmoidal recess as a rule, but not uncommonly the aperture is nearer the septum nasi. That in not one of the fifty cases he examined was there any direct communication between the sphenoidal and the posterior ethmoidal air cells.

(3) That the bony outer wall of this air sinus is extremely thin, and that in the great majority of cases it is only "paper like" between the sphenoidal cell and the immediately contiguous optic foramen and sphenoidal fissure, whilst the foramen rotundum is in a relationship almost as close. "It is from extension of the disease existing in the sphenoidal cavity, through this thin wall, that many cases of obscure retro-bulbar neuritis develop, and often end in blindness; and it is through the lateral wall that the inflammation can extend to the bundle of nerves and vessels as they pass through the sphenoidal fissure, causing neuralgia of the first division of the fifth, and this may in a measure explain why we have this branch far more frequently affected than the other two."

(4) That the septum between the two sphenoidal cavities may deviate to either side, but is quite thick compared

with the other walls—a fortunate circumstance which may prevent inflammation originating on one side from extending to the other.

Numerous measurements are given of the different diameters and cubical contents of these air cells in the specimens examined, and they only emphasise the well-known fact that endless varieties may occur. A more important measurement is that of the distance of the ostium sphenoidale from the anterior nares, with the soft tissues *in situ*; this distance was found to vary from 50 mm. to 75 mm., the average being 61·8 mm. The angle, which a straight probe with one end in the natural opening of the sphenoidal cell makes with the perpendicular, when its other end is touching the junction of the nose and upper lip, is stated to be from 35 to 40 degrees.

Holmes then records three cases of empyema of the sphenoidal air sinus, of which the first on which he operated is the most instructive.

Patient, M., aged 37, with very severe left-sided headaches of one year's duration, in the temple and behind the eye, and radiating to back of neck. Came under observation owing to failure of vision in left eye during the last two weeks. Movements of the eye-ball caused pain, which seemed to be located in the ocular muscles; globe tender; slight exophthalmos, which later subsided; supra-orbital notch exquisitely tender on pressure. V. = $\frac{20}{100}$; edges of optic disc slightly hazy; veins turgid.

Eight days later all perception of light was lost; pupil fixed and dilated; and pain on backward pressure of globe was noted.

One week later still, optic disc getting white: arteries markedly reduced; no perception of light.

Having examined the left nostril, Holmes removed the middle turbinated bone on this side, and was then easily able to open the anterior wall of the left sphenoidal cell with a 4 mm. drill used through the anterior nares. Bleeding prevented the operator from seeing what was evacuated: the relief of pain was, however, immediate. Two days later pus was evident on a probe passed coated with wool into

the sinus. Patient was five months under observation, and the only return of the headache was on two occasions; in each instance on passing a probe into the artificial opening made in the air cell a gush of pus was obtained, giving instant relief. Vision slowly returned, the periphery of the retina regaining its function first, and the papillo-macular bundle last; when last seen there still existed a small relative central scotoma; acuteness of vision is not recorded; the fields are given and are instructive.

The second case was less definite in its symptoms, and the diagnosis was not made; no operation on the sphenoidal air sinus was done: the patient died suddenly, and *post-mortem* it was found that an empyema of the sphenoidal sinus had eroded the bony roof and been the cause of a large basal hæmorrhage from a tributary of the cavernous sinus.

The third case was altogether more complicated and extensive in its lesions.

From an examination of specimens the reviewer can confirm the accuracy of Holmes' observations on the extreme tenuity of the outer bony wall of the sphenoidal air cell; it is quite fragile and translucent, and the optic foramen and sphenoidal fissure lie in direct apposition with it. That the inner septal wall is much thicker is at once apparent. Holmes has not obtained specimens for examination from subjects younger than 25 years of age; it is necessary to remember that the sphenoidal turbinated bone is not converted into an air cell until 4 years of age, and that the extension into the body of the sphenoid does not begin before 6 years old.

Fletcher Ingalls and Zeim both advise opening the sphenoidal cavity from below through the mouth by means of a dental drill, working at right angles. To the reviewer it certainly seems as if this method would be the easier and provide the better drainage; a greater thickness of bone would have to be drilled through, as the vaginal process of the internal pterygoid plate and also of the vomer add to the thickness here; the distance above the hard palate in the adult is about an inch; the hole should be drilled in

front if anything, certainly not behind the vertical plane, passing through the posterior end of the hard palate. Holmes states that he has tried this method on the cadaver, and that he finds his own method easier and safer.

The difficulty of operation seems, however, slight, compared with that of diagnosis; on this Holmes does not help us much; sufficient cases are hardly yet on record to enable us to dogmatise as to the indications for surgical treatment. The explanation of the symptoms of many cases of so-called retro-ocular neuritis on the theory of extension of inflammation from an empyema of the sphenoidal sinus is, however, very simple, and so anatomically possible that it should lead us to be on the look-out for such cases. Nettleship, in vol. iv. of the *Ophthalmic Society's Transactions*, has recorded several cases of retro-ocular neuritis, very similar to Case 1 of Holmes', and for which a similar cause, a sphenoidal empyema, may well have been responsible.

J. H. FISHER.

C. A. VEASEY (Philadelphia). **Ophthalmic Operations as Practised on Animals' Eyes.** *With* 56 *illustrations.* Philadelphia: The Edwards & Docker Co., 1896.

Although each ophthalmic surgeon may still be expected "to spoil a hatful of eyes" before becoming a skilled operator, these need not be the eyes of either his private or hospital patients. During this "spoiling" stage in his training his operations may be confined to the dissecting room, and to the eyes of the lower animals; and before touching a surgical instrument much should be done for the training of the hand and eye, particularly by freehand and mechanical drawing.

While the full mastery of an operation can only be attained by its repeated employment for the relief of patients, it is to be studied chiefly by the practice on the eyes of animals placed in the mask, or some home-made substitute. This study may be facilitated materially by a description of each operation with special reference to such practice of it. We believe that this little book meets a real need of both teacher and student.

Chapter I., General Considerations, deals with the choice of eyes, the time of their removal from the animal, their preservation for operating purposes (one-tenth of 1 per cent. solution of formaldehyde is recommended), the operating mask, a home-made mask, preparation and adjustment of the eye in the mask, and attention to details. Other chapters discuss (II.) Operations upon the Cornea, (III.) Operations upon the Iris, (IV.) Operations upon the Crystalline Lens and its Capsule, (V.) Operations upon the Sclera, and (VI.) Operations upon the Muscles. A full index completes the work.

The reader might expect some account of the more common operations upon the lacrymal passages and lids, the orbit and adjoining cavities, but none of these are mentioned, except that evisceration and enucleation of the eyeball, resection of the optic nerve, and exenteration of the orbit are included in the chapter on operations upon the muscles. Even in the portion of the subject covered, many widely used operations are not described. Only those that have proved to be of the greatest service in the author's experience have been included. The general idea gained from the practice of the methods described will be sufficient to enable the student to practise any other methods he may wish to make himself familiar with.

In general the descriptions given are clear and brief, and the illustrations well planned and wisely selected. While not so full a treatise as might be written on the subject, it will probably be found a real and valuable aid to the student of operative ophthalmology.

G. E. DE SCHWEINITZ (Philadelphia). Diseases of the Eye. A Hand-book of Ophthalmic Practice. Second Revised Edition. Philadelphia: W. B. Saunders, 1896.

Of the first edition of this work we expressed the opinion that it was remarkable for the fulness with which it reflected the notable recent contributions to ophthalmic literature. In the present edition this character is well sustained. Frequent reference to the former edition had given us the impression that no important subject within its province had been neglected. But we find in the new edition, among the additions, accounts of Filamentous Keratitis. Blood-staining of the Cornea, Essential Phthisis Bulbi, Circinate Retinitis, Symmetrical Changes at the Macula Lutea in Infancy, Hyaline Bodies (Drusen) in the Papilla, Subconjunctival Injections of Germicides, Infiltration Anæsthesia, Sterilisation of Collyria, Ophthalmia Nodosa, Electric Ophthalmia, and Angioid Streaks in the Retina.

The most extensive alterations and additions are found in the chapter on operations, and in an appendix giving particularly full and clear instructions as to the use of the Ophthalmometer, and the "Tropometer" devised by Dr. Stevens. De Schweinitz says: "The Ophthalmometer is exceedingly useful, and one of the most important of all the instruments of precision we possess for the diagnosis of astigmatism of the cornea; but it should never be used for the prescription of glasses to the exclusion of other methods—the trial lenses after mydriasis and retinoscopy." Of the value of the Tropometer the author expresses no opinion, merely saying: "Dr. G. T. Stevens attaches special importance to the determinations, absolute as well as comparative, of the rotations of the eyes."

Of subconjunctival injections of germicides, De Schweinitz says: they "are recommended in cases of inflammation of the uveal tract and episcleral tissue (iritis, irido-cyclitis, and scleritis), and are sometimes efficacious. They are of less value in chronic inflammations of the cornea (interstitial keratitis), and the author has never seen them accomplish

the slightest good in diseases of the retina or optic nerve, nor is his experience with them in choroiditis of a favourable kind, although they have been highly recommended in the treatment of this disease. Recent investigations indicate that the germicide employed has little therapeutic value, as solutions of sodium chloride act with equal efficiency."

This book, of 680 octavo pages, is now one of the most complete treatises on ophthalmology in the language. Of its 256 illustrations more than one-third are new in the present edition. Some of these replace less perfect illustrations of the same subjects in the former edition; but forty of them are entirely new in subject as well as in form. In the excellence of its illustrations and the quality of its presswork the book reaches a very high standard.

FICK (Zurich). Diseases of the Eye and Ophthalmoscopy. A Handbook for Physicians and Students. *Translated by Albert B. Hale, Chicago.* London: H. Kimpton, 1896.

The volume before us has two prefaces: one by the author, in which he offers as an apology for the publication of his book the complaint of students that the best text-books of ophthalmology are too exhaustive; the second, by the translator, in which he expresses the hope that the profession will criticise both the author's and the translator's handiwork. The responsibility for a volume such as this is, however, very unequally divided; the writer has to bear the disparaging, or enjoy the commendatory remarks of his critics, upon the matter contained in the book and the arrangement thereof; the translator, on the other hand, if he has merely translated and not edited, is responsible solely for the rendering of the author's ideas into another language.

Dr. Hale, in his preface, leads us to believe that his

work has been to translate Dr. Fick's writing, and on comparison we find that the edition in English follows very closely, almost exactly, the edition published in Leipzig.

Dr. Hale's part of the work has, on the whole, been well done, but we think he lays himself open to criticism in several ways. He is addicted to the use of long, unpleasant terms where simpler, more euphonious words would serve equally well; *e.g.*, he speaks of "ectropionizing" the eyelids, instead of "everting." His sentences are often complex, suggesting an endeavour on his part to fully translate the original, and are not seldom clumsy. Expressions are used which are possibly familiar to American students, though not in current use in England. These defects (as they seem to us) can all be easily remedied in another edition.

He has added two appendices: (*a*) containing a short list of "Abbreviations used in Ophthalmology," and a "Table for converting metric into troy weights;" (*b*) "Etymologies," a list of technical terms, with derivations and meaning. This will probably be useful to students; the table for converting measures of weight might well have been omitted.

The book is divided into two parts. Part 1 (pp. 1 to 140) deals with the methods of examination of the eye and its functions, and various tests for acuteness of vision, colour and light sense, intraocular tension, &c. For the estimation of tension Fick recommends the use of a tonometer, and prefers that devised by his namesake, A. Fick. The chapter on Refraction, normal and abnormal, is clearly written, and not too long for students. In the instructions to the beginner in the use of the ophthalmoscope, the author perpetuates the time-honoured—but in our opinion mistaken—practice, of telling the patient to look at the surgeon's ear; in spite of the writer's assertion, we think this always induces an accommodative effort. We also take exception to his statement that "most ophthalmologists examine the patient's left eye with their right eye."

Part 2 (pp. 141 to 467) is devoted to Diseases of the Eye,

arranged in the usual order. Each section is preceded by a short anatomical and physiological introduction, some parts of which might be omitted.

We can, on the whole, greatly commend the second part of the book. The descriptions of the symptoms and signs of disease, and of the methods of treatment are generally well written and sound, and give the student an intelligible and fairly succinct account of modern ophthalmic medicine and surgery. It is, of course, easy to find opportunities for criticism, but with very few exceptions the faults, as we consider them, are trivial, and are more those of omission than commission. It is worthy of remark that "keratitis punctata" is placed among the diseases of the cornea (though its pathogenesis is correctly described), and that the section on toxic amblyopia contains no reference to tobacco or alcohol as causative agents. The defect of sight produced by these drugs is described under retro-bulbar neuritis. Under "Exophthalmic Goitre" the great danger to sight from ulceration of the cornea does not receive due attention. In diseases of the orbit we find no mention of the results of frontal sinus mucocele or empyema.

The illustrations throughout the book are numerous, and many are very good. Some, however, leave much to be desired; as examples we may mention figs. 51, 74, 77. It is not fair to lead a student to suppose that fig. 51 represents a normal *macula lutea*, or that he will ever see structures such as are depicted in fig. 74. The coloured illustrations (*e.g.*, fig. 96) showing lesions in the anterior parts of the eye seen by "transillumination" are not successful on the whole, and not more helpful than they would be in black and white. The book is remarkably free from printer's errors.

UHTHOFF (Breslau). A Bow-shaped Keratoscope. *Klin. Monatsblätter für Augenheilk., July*, 1896.

The author describes an instrument which he has invented and found useful for demonstrating irregularities in the curvature of the cornea. It consists of a strap (? of steel) 6 cm. wide and curved to the form of a bow, with a radius of 15 cm. It is held in the horizontal position by means of a handle with two branches, one of them supporting the instrument and the other holding an oblique plate intended to fit against the malar bone of the patient. Its concave surface (which is opposite to the patient) is divided into alternate white and black bands of equal width, three black and four white. In its middle point is a hole through which the surgeon observes the reflection of the black and white bands on the cornea of the patient, who of course sits with his back to the light. The result is a keratoscopic picture which extends across the whole width of the cornea. The instrument is made with a hinge so that it can be inclined up or down from the horizontal, the angle being read by a scale placed on the convex side, and in this way the lines can be seen reflected in any meridian, and thus the whole of the cornea investigated. There is a difficulty with the more vertical meridians, the reflection from the peripheral parts of the cornea being cut off by the projections of the brow and face. This, however, can be overcome by providing a point above or below the observation hole for the patient to fix, and so bringing respectively the lower or upper parts of his cornea into the area illuminated.

The advantages claimed for this instrument are : first, that it gives a picture of the whole horizontal meridian of the cornea at once, and secondly, that owing to the curve of the instrument the actual lines are kept at an even distance from their corneal reflections. The instrument might be made more complete (the author suggests) by adapting it to a fixed stand with chin-rest, and an apparatus for measuring the dimensions of the figures. Accompanying the paper are six examples of figures obtained by the instrument in its present form, showing, on the one hand,

the image with straight lines obtained from the normal cornea, and on the other, the various distortions produced by conical cornea, general flattening of the cornea, and the scars of marginal ulcers.

A. H. THOMPSON.

KOLLER (New York). Reading with Defective Vision. *Annals of Ophth. and Otology, St. Louis, U.S.A., vol. v., pt. iv., October,* 1896.

The author was induced to investigate the relation between acuity of vision and ability or inability to read, from the examination of some cases of stationary defect of sight from various causes, in people to whom inability to read was a great deprivation. As a result of his inquiries, he devised a reading glass which proved of great assistance to such cases.

In this paper he publishes an account of his investigations, and describes the apparatus of which a woodcut is given.

The ability to read depends, apart from the integrity of the cerebral centres, upon a sufficient degree of acuity of vision ; and although a good field of vision is important, it is not essential. The term acuity of vision is taken to mean the power of distinguishing letters of definite size at a definite distance ; this power, the writer states, depends upon the size of the retinal images.

For reading the print of most books and newspapers, at the usual distance, an acuteness of vision considerably below the standard is sufficient.

Koller measured the type " of a number of the principal newspapers " with the microscope. He found that the majority corresponded very closely with No. 4 Jaeger type, or with Snellen's No. 4. Smaller type is not commonly employed in books or papers.

Of the two types mentioned, Jaeger No. 4 ought to be read by a person with standard vision ($\frac{6}{6}$) at a distance of 90 cm., and is actually read by most persons with good sight at a distance of rather more than 100 cm. Snellen No. 4 should be read at 100 cm. (where it subtends an angle of five minutes) and is actually read at about 110 cm.

The customary reading distance is 25 to 35 cm., *i.e.*, about $\frac{1}{3}$ to $\frac{1}{4}$ of the distance at which the types can be distinguished. The retinal images of these types, held at the ordinary reading distance, will therefore be considerably larger than is necessary for deciphering them; consequently a person with vision of $\frac{6}{18}$ to $\frac{6}{24}$ (*i.e.*, $\frac{1}{3}$ to $\frac{1}{4}$ of the standard) will be able to read medium-sized print at the above-mentioned distance.

An acuity of vision below $\frac{6}{36}$ (except in myopia) renders people unable to read medium-sized print.

Myopes with defective vision have a great advantage over amblyopes, whose refraction is emmetropic or hypermetropic. By bringing the type near the eye they increase the size of the retinal images to such a degree that persons with very defective vision often surprise us by reading small print with ease. The superiority, in regard to reading, of myopic eyes with defective vision, indicates a way of helping amblyopic eyes which are emmetropic or hypermetropic. The retinal images must be enlarged to a degree sufficient to enable them to distinguish type of a certain size.

Koller concludes that the ordinary hand-magnifying lens, the Bruecke-Chevalier Loupe and Steinheil's Conus, are not of much assistance to patients; the first-named is awkward to use and gives but little magnification; the other two have the serious drawbacks of a very narrow field and large displacement of the image on very slight movement of the instrument.

There are two chief ways in which enlargement of retinal images can be obtained:—(1) The eye and object remain in their relative positions; by the interposition of an optical instrument (*e.g.*, a telescope) the posterior nodal point is advanced, and enlargement results; (2) by bringing the

object and the eye closer together and taking care that in spite of the altered distance clear retinal images are formed; this is exemplified in the accommodation of the eye.

Koller has employed the second principle in devising his apparatus; and has made use of strong convex lenses of 15 D. to 30 D. to construct a reading glass.

The lens is placed 5 cm. from the eye, at the end of a short aluminium tube, blackened inside and out, fastened into a spectacle frame. The distance at which the type can be held is small and the field of vision is limited (sufficient to include several words), but the glass being fixed, only the paper has to be moved past the eye or the head along lines. The other eye should be excluded by an opaque plate. Koller's notes of a case in which the apparatus was used, are as follows:—Mrs. S., aged 59, suffering from diabetes, but active in body and mind, has been unable to read for three years, on account of insufficient vision. V. $= \frac{3}{60}$ in each eye, that is $\frac{1}{5}$ of the acuteness necessary to read No. 4 Jaeger at an ordinary distance. To enable her to read this print, the retinal images would have to be enlarged five times, if the paper is held at 30 cm. This can also be accomplished by holding the type at 6 cm. from the eye, and would necessitate an addition of 16 D. to the refraction of the eye.

The holding of the paper at so short a distance is inconvenient and accompanied by considerable difficulties in the matter of illumination. With a 16 D. lens arranged as described above, the paper could be held at 10 cm. from the eye. In a short time the patient had learned to use this arrangement, and read her daily paper with comparative ease for five years.

In the course of six years Koller has had a similar reading-glass made for five patients. In a limited group of cases the device is undoubtedly of practical value.

J. B. L.

VAN DUYSE: A Contribution to the Knowledge of Ocular Colobomata. *Arch. d'Opht., July and September*, 1896.

The eyes of which Van Duyse here gives a pathological examination were obtained from the body of a woman, aged 41, who had died from pulmonary tuberculosis. The few facts which could be obtained as to her vision showed that she had been able to do work requiring moderate visual acuteness, but that while she had at one time been able to recognise persons at forty metres, during the last few years of her life this became reduced to four metres. In this connection it may be observed that the antero-posterior measurement of the left (better) eye somewhat exceeded the normal (26 instead of 24 mm.) The other measurements of this eye were approximately normal, the cornea was circular and 11·5 mm. in diameter, the angle of the anterior chamber free.

The condition of the iris, ciliary body and lens was identical in the two eyes. There was a coloboma of the iris directly downwards; where the borders of the fissure met below, the circle of the ciliary processes was drawn backwards in a V, about eight of the processes being involved in it; these diminished in size as they approached the angle of the V. The lens showed a slight indentation of its lower margin. The suspensory ligament appeared complete, and there was no appreciable anomaly of the vitreous body.

Dividing the eyes by a horizontal section passing just above the optic nerve, the upper portions were found to be normal.

Looking into the lower half of the left eye, the surface of the retina was seen to be interrupted by two rounded depressions. The smaller of these, about 5 mm. in diameter, corresponded in part to the insertion of the optic nerve, but extended beyond it in a downward and outward direction. The other, about 9 mm. in long diameter and 6 mm. wide, began a little in front of the first and passed forwards and a little outwards towards the ciliary processes,

its anterior extremity being joined by a pigmented raphe to the apex of the backwardly-projecting V already mentioned. There was a bridge of normal retina, about 1 mm. wide, between the first depression and the second, and there was an indication of a second similar bridge incompletely dividing the latter between its anterior and middle thirds. The edges of both depressions were sharply defined, slightly rising above the general surface. There was some pigmentation around them, especially in front of the anterior. The smaller depression was the deeper, the floor being about 1·5 mm. below the general surface of the retina; the surface of each was of white and tendinous aspect. The retinal vessels made their appearance at the edges of the smaller depression or a little outside them; one or two could be seen crossing the floor of the larger. To the outer side of the optic nerve, about 1·5 mm. from the edge of the excavation, a slight dimple was perceptible; microscopic examination, however, gave no indication of the special structure of a fovea centralis in this position.

In the right eye the coloboma formed a single large area of circular form embracing both optic nerve and macular regions. Its general surface was but slightly lower than the level of the rest of the retina: at the optic nerve entrance, however, there was an excavation similar to that existing in the same position in the other eye.

In neither eye did the external surface of the globe give any indication of the coloboma within, only the section of the optic nerve showed a greatly increased thickness of the lower part of the dural sheath, together with a reduction in volume of the nerve bundles in proportion to the supporting tissue in the lower segment of the nerve.

In the left eye the central retinal vessels had already entered the nerve where it was cut, at 8 mm. behind the globe; in the right their point of entrance could be determined to be at 9 mm. from the eye.

Passing to the microscopical examination, the changes in the various layers in the colobomatous area were as follows:—The *retina*, as it approached the margin, lost its pigment-epithelium layer (in some places this appeared to end

in a folded edge) and its rods and cones, the molecular layers became indistinguishable, the granular layers thinned and fused into one, the connective tissue increased in bulk and œdematous, the nerve fibre and ganglionic layers atrophied; in places nothing remained but a tract of fibrillary tissue covered by the internal limiting membrane; the latter was everywhere present and distinct. The *choroid* lost first the chorio-capillaris, then almost immediately the stroma with the large vessels, the lamina fusca alone persisting. Everywhere in the vicinity of the coloboma the atrophied retina presented points of adhesion with the supra-choroidal layer, in places heaping up of pigmented cells and deposits of pigment in the sheaths of the larger vessels; evidences of a former diffuse choroido-retinitis. The *sclerotic* was for the most part unaltered, but in sections through the depression in the region of the nerve entrance, it was thickened by fusion with the thickened optic nerve sheath, and presented among its lamellæ towards the internal surface many cystic spaces which were every here and there continuous with the colobomatous excavation and lined by a layer of tissue which seemed to be directly continuous with the modified retina lining the latter. The prominence of the edges of the coloboma was due to localised thickening of the sclerotic by pigmented interstitial tissue. The *optic nerve fibres* occupied their normal position, in so far that the coloboma did not excavate the nerve; the upper border of the excavation was formed by the lower part of the obliquely-placed disc.

The *ciliary region* and *ciliary processes* presented microscopically no definite alterations; they merely appeared ill-developed and displaced in the region of the coloboma.

The author's views as to the bearing of the appearances here described on the theory of the production of colobomata are set forth at some length in the second of the two papers; they may, perhaps, be summarised as follows: The abnormal persistence of the pedicle of the mesodermic intrusion prevents the normal closure of the optic fissure; this is finally filled in by a mass of "intercalary" connective tissue, which takes the place of sclerotic, but behaves in effect like cicatricial tissue; its contraction causes the

dragging out of place of the iris and ciliary processes, its compression of the vessels piercing it causes local irritation, œdema and inflammation, and leads to softening and ectasia of the scleral tissue, as well as to the inflammatory appearances about its margins. The primary cause of the coloboma he would trace to a defect in the evolution of the encephalon or its coverings.

W. G. LAWS.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

E. NETTLESHIP, F.R.C.S., President, in the Chair.

THURSDAY, NOVEMBER 12, 1896.

Intraocular Cysticercus.—Notes of a series of cases were read by Dr. Hill Griffith. His first two cases were living specimens. A blue cyst could be seen in the eye with a neck waving about in the vitreous; in the first of these specimens destructive inflammation followed, and the eye was removed; in the second case the globe was opened by a meridional section of the sclera at the equator by Dr. Little; the wound gaped, the cyst presented itself and was removed. In the third case the patient was a youth, aged 17. Vision had been failing for two years; there was total detachment of the retina and the tension was − 3. The space behind the detached retina contained a cysticercus, with a concentric arrangement of bluish-coloured lymph, which he considered to be characteristic of cysticercus. The fourth specimen, an eye lost from slow destructive inflammation, showed the same rounded bluish mass in the vitreous. The fifth case presented nothing remarkable. The sixth case showed all the characters of a cysticercus, and had the concentric arrangement of fibrous

tissues, but its head could not be seen ; he could not, therefore, be certain that it was a cysticercus, although he felt pretty sure of it. The seventh case was that of a child aged $3\frac{1}{4}$ years, with cataract in the right eye, and without perception of light, a white opacity deep in the globe. Glaucoma came on, and the eye was removed. The interior of the eye was lined throughout with a dense membrane in the situation of the hyaloid membrane, consisting of an immense number of layers of fibrous tissue. In this lamellation of the outer membrane the cyst resembled a hydatid; he did not know if hydatid has been seen to occur in the eye, but the resemblance was so strong that he could not help thinking that this was its nature. All these cases occurring at Manchester made it probable that cysticercus is not so uncommon as it was thought to be in England. Where there had been slow gradual failure of an eye without much inflammation, and with a mass of rounded lymph in the vitreous, the case was probably a cysticercus.

The President remarked that very few in England knew much about cysticercus ; possibly this was due to its being sometimes overlooked. There might be something special in the condition of Manchester giving rise to the occurrence of cysticercus. It was known to have a very different distribution in different parts of Germany ; it was common in Berlin and very rare in Vienna.

Mr. Lawford asked what were the conditions under which the patients lived, and also whether these cases were due to tænia solium or tænia medio-canellata.

Mr. Hartridge asked if the patients were English or Germans, and what food they ate.

In reply, Dr. Hill Griffith knew nothing of the habits of the patients previous to their being seen ; they were all English. He did not know whether the worm was tænia solium or tænia medio-canellata.

Modification of the Usual Method of Mounting Specimens in Glycerine Jelly.—This paper was read by Mr. Devereux Marshall, who said he had frequently noticed much incon-

venience arise from the comparatively low melting point of the glycerine jelly in which museum specimens were mounted; another objection was that the colour of most of the jelly was distinctly brown. He recommended the following method as producing jelly which was only slightly coloured: Cut up 30 grammes of the best French gelatine and allow it to soak in 240 cc. of cold saturated solution of boracic acid (made by dissolving boracic acid in boiling distilled water). Add 80 cc. of glycerine and the white and shell of one egg. Heat this in a water bath, and when the albumen was being precipitated add 1 cc. of glacial acetic acid. Boil for several minutes and filter through flannel; then again filter once or twice through filter paper in a hot water funnel. In order to make this resist heat the following simple method was adopted: Pour a sufficient quantity of the melted jelly into a test tube containing some formol in the proportion of 3 or 4 minims of the latter to a drachm of the former. Thoroughly shake together and proceed to mount the specimen in the usual manner. The jelly does not undergo any alteration in appearance by the addition of the formol, nor does it show any additional tendency to set more quickly. But after twenty-four to forty-eight hours it will be found to have become quite incapable of being again melted by any amount of heat. It can be raised to any temperature or held in a test tube in a Bunsen flame until heated to boiling point, and yet it will not melt. Water may be boiled on its surface without any change whatsoever taking place in the solid mass of jelly. If less gelatine be used a still whiter jelly can be produced, but it is not so firm; even then, however, it still failed to melt with heat, after the addition of formol, but possibly after a time this thinner jelly might shrink, whereas the other certainly does not. This would prove most useful to those who wish to have permanent preparations, even if they resided in very hot climates. Dr. Welder, of Chicago, had recommended exposing the surface of the jelly to the action of formol, but the author preferred mixing it as above described.

A Stitch for the Adjustment of the Ocular Muscles.—This paper was read by the secretary for Dr. H. Lindo Ferguson. After exposure of the tendon by a vertical incision, it is divided and held in the forceps. A suture is then passed through the conjunctiva and tendon at the edge of the latter, then through the subconjunctival tissue as far as the upper part of the cornea, when it is brought out on to the surface. The other end of the suture, armed also with a needle, is similarly passed through conjunctiva, tendon, and episcleral tissue to a point corresponding with the other thread at the lower part of the cornea; the middle part of the thread thus forms a loop over the middle of the tendon; the upper end of the thread is then passed beneath this loop and tied to the lower end, thus drawing the tendon and conjunctiva into place.

Card Specimens.—Messrs. Anderson Critchett and John Griffith: Implantation Dermoid Cyst of Orbit, with Microscopical Preparations.—Mr. Juler: Case of Retinal Œdema with Sudden Failure of Lower Half of Left Nasal Field of Vision.—Messrs. Brailey & Eyre: (1) Tuberculous Growth from Conjunctiva; (2) Membrane on Caruncle, due to Friedländer's Bacillus.—Mr. Ernest Clarke: Green Cataract.—Mr. Fischer: Hyaline Bodies in Optic Nerve.

OBSERVATIONS ON THE RETINAL BLOOD-STREAM AT THE TIME OF DEATH.

By C. H. Usher.

Ophthalmic Surgeon Royal Infirmary, Aberdeen.

The sequence of events that occurs in the retinal vessels, from the period when they lose their normal appearance, at the time of death, to that at which the blood within them comes to a standstill, is not generally known, nor indeed can I find any previous mention of it. Many observers have studied the changes in the *fundus oculi* resulting from stoppage of the heart's action, and arrest of the circulation of the blood, changes which are among the most unequivocal signs of death.[1] Amongst these there is often seen a beaded appearance of the retinal vessels which is produced by the interruption of the red blood column by clear spaces, but it is to the changes that take place in the vessels before the time when beading begins that this paper refers. My own observations have been made, by the direct method of ophthalmoscopic examination, on the fundus of the human eye, and subsequently on the eyes of the rabbit, monkey, and cat.

My thanks are due to Dr. Dean for his valuable aid, more especially in the carrying out of a few experiments that were made, in order, if possible, to clear up the meaning of some of the appearances that do occur at the period referred to.

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[1] Gower's "Medical Ophthalmoscopy," third edition, p. 297.

Ophthal. Review. Vol. XV., No. 182, December, 1896.

The following extracts are from notes of the condition seen in the human *fundus oculi* by the ophthalmoscope at the time of death. These refer principally to the retinal blood-stream, the condition of the other parts of the fundus being purposely omitted.

Case 1.—A boy, aged 3. There was a history of vomiting and diarrhœa for three days. Nothing abnormal was detected in the chest or the abdomen. The child was unconscious. The pupils were dilated and did not react to light. There was a very feeble conjunctival reflex. The pulse could not be felt at the wrist.

An ophthalmoscopic examination was made immediately before and after death. At first the fundus of the right eye appeared normal. The breathing was at this time getting feeble and slow. At the time of the last respiration the blood in a large retinal vein near the upper margin of the optic disc, which was then under observation, all of a sudden appeared to break up into granules which rapidly moved towards the centre of the optic disc; this visible movement of the blood lasted for about two seconds only, the blood in the vein then remained stationary, presenting a granular appearance. The patient gave one more gasp after the movement of the blood stream was seen. The retinal arteries examined immediately afterwards were found to be empty. About two minutes later there was marked beading in the veins. Pressure applied to the globe caused no movement of the beads of blood. The tension at the end of the examination was -1.

Case 2.—A boy, aged 5. He was run over and died of internal injuries shortly after admission to the casualty room. He was running about in good health before the accident. The lips were livid and the surface cold.

Ophthalmoscopic examination: The fundus of the left eye appeared normal when first examined; the respirations had previously stopped for a few seconds, but a few more gasps were then given, and the blood in the main vein running downwards to the optic disc began to get granular, and the blood could be seen flowing towards the optic disc; no doubt the same condition was present in the other veins that were not under observation at that time. The movement of the blood was slow, it lasted for about ten seconds. When the blood flow became visible the blood column in the vein was unbroken. The normal homogeneous appearance of the blood in the vessels became at first finely granular, and later on more coarsely granular; still later beading occurred, the red blood columns being broken up by clear gaps. There was a granular appearance in the arteries also. No further change in the vessels was produced by pressure on the globe. The pupils were widely dilated. The tension was -1 after the examination.

Case 3.—A girl, aged 5. She died from diphtheria, tracheotomy having been performed four days before death.

An ophthalmoscopic examination was made a few minutes before, at the time of, and after death. The retinal vessels of the left eye when first seen appeared normal, the veins were full. The respirations were gradually getting slower. The first abnormal appearance detected was the visible flow of the blood in the retinal vein in a direction towards the optic disc. A similar appearance was seen in the corresponding artery shortly afterwards, namely, a visible flow of the blood in it *towards* the optic disc. Respirations still continued. The blood column in the vein gradually diminished in bulk, but on two or three occasions during a respiration the vein became suddenly greatly distended. The flow of blood in the vessels was visible for about

two minutes. The main lower division of the retinal vein was greatly distended and the blood in it was broken up and granular, also the margins of the red blood column were sinuous. The flow in the vessels was slow. After the cessation of the respiration the arteries and veins were markedly beaded. An examination of the right fundus oculi was made immediately after that of the left. The vessels were moderately beaded; no alteration was observed on compressing the globe. The tension was - 1 when estimated after this examination. In this case the respirations continued, but were infrequent and irregular when the blood was seen flowing in the retinal vessels.

Case 4.—A man, aged 26, died from pneumonia on the seventh day. The temperature was 105° at death. *Ophthalmoscopic examination of the right eye:* The granular appearance was noticed in the retinal vessels almost immediately after the examination began. The patient gasped twice during the examination of this eye. In the veins the blood flowed towards the optic disc. The granular condition became extremely well marked both in the large and in the small blood-vessels. In the arteries the blood flowed towards the optic disc, this lasted for about fifteen seconds; beading was not so marked as in the veins. The examination of this eye lasted for about two and a half minutes; during the whole of this time the venous blood continued moving. The left eye was examined immediately afterwards. The blood in the veins was flowing in broken masses towards the optic disc; this continued for perhaps half a minute, so that from the commencement of the visible flow in the veins of the right eye to the cessation of the flow in the veins of the left an interval of about three minutes elapsed. The pupils were widely dilated. The tension was —2 in each eye at the end of the examination.

The movement of the blood seen in these cases

suggests, in some degree, the appearance seen by the ophthalmoscope in the vessels of the frog's eye. The rate and duration of the visible movement of the blood-stream appeared to vary in the different cases. In Case 1 the flow was rapid and continued for only two seconds; the vein was then not empty, but the blood in it was stationary. In Case 4 the flow could be seen for three minutes; it was less rapid than in the previous case. In the veins the blood moved in the direction of the circulation, namely, towards the optic disc, but in the arteries the blood moved in a direction against the normal blood stream, namely, towards the optic disc, a condition that *à priori* might not have been expected. The changes were more readily seen in the veins than in the arteries.

In two other cases, although examined at the time of death, no movement of the blood was seen. The one was a man, aged 50—a case of suicide. He was run over by a train, receiving head injury, and injuries to a leg and arm necessitating amputation. He died in a few hours. The fundus was seen with difficulty, the pupils were not dilated. He did not breathe after the first good view of the fundus was obtained. At that time the arteries were empty, and the blood-column in the veins was narrow and granular, but no gaps were present in them. The other was a man, aged 28, a case of cut throat with injury also to the head. There had been much loss of blood. The fundus was examined immediately after the last respiration; the arteries were empty, and the veins very narrow, but the blood column appeared continuous. The pupils were dilated. The tension was −2 or −3. I have no note of opacity of the media in this case. Possibly the flow had been of as short duration as in Case 1, and had occurred before the examination began.

The chief difficulty in the examination of these cases was due to opacity of the media.

Similar appearances to those seen in man, namely, the granular condition of the blood, and its flow towards the optic disc in both arteries and veins, were observed in rabbits. The respiration ceased, at times that varied from fifteen seconds to one and a half minutes, before the movement of the blood in the retinal vessels was detected. The duration of the visible flow in the retinal vessels was from three-quarters of a minute to one and a half minutes. The majority of the rabbits were killed by ether. In the case of two rabbits that were killed by chloroform, the blood became finely granular, and later on beading appeared in the vessels, but no movement of the blood was at any time detected.

Monkeys were found to be not very suitable for examination because of the rapid onset of haze of the media. Two of them, killed by chloroform, showed the granular condition of the blood, and its flow in both arteries and veins, towards the optic disc. The respirations continued in the first monkey for a short time after the flow was seen. Cats are much more suitable for observation than monkeys or rabbits, because the media remain clearer at death, and the retinal vessels stand out clearly against the bright, greenish-white glistening background ; a mydriatic is not required, as the pupil dilates widely and becomes circular.

The results obtained from cats differed as regards the arterial circulation from those obtained in the other animals and in man. In the cat the first visible flow in the arteries is in a direction away from the optic disc ; later, however, its direction is reversed. The venous circulation is the same as in the other animals.

With a view to determine the relation of the visible flow in the retinal vessels to respiration and the heart's

action, the following two sets of observations were made: (1) during the application of the faradic current to the heart; (2) during the administration of a lethal dose of chloroform.

The movements of a needle, inserted through the chest wall into the heart, indicated the cardiac action. At the same time as the retinal circulation was under observation, the respirations and heart's action were watched by an assistant, and the occurrence of the various events were noted by a third person.

The following are the results in tabulated form.

The times noted in the first three cases refer to the intervals that elapsed from the onset of the faradic current.

CAT (1).

Respiration at first consisted of a few deep inspirations, which were soon followed by irregular and spasmodic efforts at respiration that continued until the respiration finally stopped. Respiration continued for one minute twenty seconds.

Retinal Vessels.—The flow became visible in thirty seconds. In the *veins* it was towards the optic disc. In the *arteries* the flow was first seen moving away from the optic disc, then towards it, then away from it again, oscillating thus at intervals of from five to thirty seconds. In two and a half minutes the movement was towards the optic disc, and continued so until it finally stopped. The flow lasted altogether for four and a half minutes.

CAT (2).

Respiration at first consisted of one or two rapid inspirations, rapidly followed by shallow and jerking respiration. Respiration continued for one minute and forty-five seconds.

Retinal vessels.—The flow was visible in the *veins* in thirty-five seconds; and in the *arteries* in one minute and three seconds. In both arteries and veins the blood current had a direction towards the optic disc. In three minutes the flow had become very slow and there was beading. The flow lasted for five minutes.

Cat (3).

Respiration continued for two minutes and five seconds. This time includes a long interval before a final gasp was given.

Retinal vessels.—The flow in the *veins* was visible in thirty-five seconds; it was towards the optic disc, and lasted for five minutes and twenty-five seconds. The flow in the *arteries* was first visible in forty-five seconds; when first seen it moved away from the optic disc, it then suddenly stopped, then oscillated for a few seconds, and in one minute forty-five seconds finally moved towards the optic disc. It gradually became slower, and stopped in three minutes forty-five seconds. Beading was seen in both arteries and veins in four minutes fifty seconds.

Cats (4) and (5) were killed by chloroform.

Cat (4).

Respiration stopped at the same time as the visible flow began in the vessels.

Heart stopped three minutes ten seconds after respiration, and after the blood was first seen flowing in the vessels.

Retinal Vessels. — The visible flow began when respiration stopped. In the *veins* the flow was towards the optic disc, and continued for four minutes twenty seconds. In the *arteries* the flow alternated, at one time going away from the optic disc, and at other times going towards it; for some seconds it was stationary, and then finally flowed towards the optic disc. It lasted for four minutes fifty seconds.

Cat (5).

Respiration stopped first.

Heart stopped four minutes after respiration.

Retinal Vessels. — The final[1] flow in the vessels began forty-five seconds after the respiration stopped. It continued for seven and a half minutes.

[1] In this case a granular appearance of the blood occurred in the retinal arteries and veins, and a flow towards the optic disc was seen before the respirations, or heart, had stopped; the anæsthetic was discontinued, and

The granular appearance and visible movement of the blood were seen in both groups (1) and (2). The heart continued beating for some minutes after the movement was first seen in the vessels in the two cases where death was caused by chloroform. The movement of the blood towards the optic disc continued after the heart had stopped beating.

The change in the appearance of the blood, from a homogeneous to a granular condition, and the occurrence of a visible flow in the retinal arteries and veins, is not incompatible with continuance of life, and probably permanent recovery, as was shown by cat (5); this can be demonstrated also by bleeding a cat until the retinal flow is seen; if the bleeding is then controlled the retinal circulation becomes normal again.

With a view to determine the influence of the intra-ocular tension on the blood column in the retinal vessels the anterior chamber was tapped, but, after the escape of the aqueous the fundus could not be seen until the cornea was removed, when a clear view was again obtained by using a + 12 D. lens. The cat was now killed, and although the vessels appeared much smaller than in a normal eye, yet a fine granular appearance was present in the arteries and veins, but no visible movement occurred in the blood columns, and no beading had occurred, even ten minutes after death. This experiment was repeated on another cat; the only modification was the removal of a piece of iris, which was found to be necessary because the fundus could not be seen in consequence of the very great contraction of the pupil after the cornea was removed. A clear view of the fundus was obtained and the

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in one minute twenty seconds the vessels had again assumed their normal appearance. Chloroform was again administered with the above result.

At the time when the first movement was seen in the vessels, the needle in the heart moved very rapidly, the respiration had stopped once or twice, intervening spasmodic efforts occurred. Both the heart's action and respiration became regular again when the anæsthetic was discontinued.

results coincided with those of the previous experiment, namely, there was no visible movement of the blood, though the blood appeared granular, and there was no beading. The other eye, which was not interfered with, showed, after respiration ceased, beading of the vessels, and a flow of the blood stream towards the optic disc in the veins and arteries. Ten minutes later the vessels in this eye were nearly empty, whilst the appearances of those in the eye operated on remained unaltered.

The intraocular tension would appear, then, to be an essential factor in the production of beading and the emptying of the retinal vessels at the time of death. During life, with the object of causing an increase of tension in the eye, a saline solution was forcibly injected into the vitreous of a cat; a visible movement of the blood towards the optic disc was caused in both arteries and veins; it lasted for a short time only, the circulation soon becoming normal again. After a second injection into the same eye a granular condition of the blood was again seen, but there was no movement; before long, however, the blood in the veins began to move; at first slowly and then gradually more rapidly, towards the optic disc. The first movement in the arteries consisted of short jerks in a peripheral direction; after each of these the blood was stationary, but gradually the flow became constant, and the circulation in the retina resumed its normal appearance.

A sudden increase of tension in the eye produced by the injection offers an explanation for the blood being driven out, during life, from both retinal arteries and veins, in a direction towards the optic disc, and a subsequent diminution of this abnormal tension accounts for the circumstance that the normal circulation was again resumed. This experiment suggests a method of treatment in cases of retinal embolism

seen early. The amount of pressure required to cause regurgitation of the blood in the retinal artery was not estimated; a hypodermic syringe was used for injecting. A third injection was made into the vitreous after beading had occurred in the vessels as a result of chloroform inhalation; this time no change was detected in the vessels, the beads were not driven out, and the vessels appeared as full as those in the other eye. This result corresponds with the absence of alteration in the appearance of the vessels after external pressure had been made on the globes in the cases observed in the human subject, but it also adds weight to the opinion that the dislodgment of an embolus may be impossible by the foregoing method, because the artery would probably present a condition more nearly related to the condition of the vessels in the cat at the time of the third injection than at the first injection.

Aldridge[1] in his paper, and under the heading "Observations on the Eyes of the Dying and Dead with the Ophthalmoscope," says that one of the points common to all his cases was "that the arteries begin to empty themselves in the direction of their current." This is entirely contrary to my observations on the human subject, neither does it correspond with the early visible flow in a direction away from the optic disc seen in the arteries of cats, because from an examination of the reports of Aldridge's cases it appears that the earliest observation that he made of the fundus, excluding the examinations during life, was eight minutes after the last respiration. In a number of human eyes examined from two to thirty minutes after death, I have never seen the arteries empty themselves in the direction of their current.

The retinal vessels (of the cat) can be filled with

[1] "The West Riding Lunatic Asylum Medical Reports," 1871, vol i., p. 78.

blood again, after death, by pressing on the abdomen; the blood enters directly into the arteries and veins if the pressure is made soon after death; later on the arteries are filled by blood passing to them from the retinal veins through the capillaries. When the pressure on the abdomen is relaxed the vessels empty again.

With reference to the question of the value of the various changes in the fundus oculi as a sign of death, it may be stated that more than once during these experiments a living animal was considered to be dead, judging from the ordinary signs. A good example of this was monkey (3). Chloroform had been administered, the respirations had stopped for a long time, and the anæsthetist, feeling sure that the animal was dead, went away. I also thought that the animal was dead, but as no beading, and no movement of the blood had been observed in the retinal vessels, the examination of the fundus was continued. To our astonishment spasmodic, and very irregular, breathing began again, and after some minutes the optic disc became very red, and the retinal vessels normal in size. No conjunctival reflex was present. More chloroform was now given, and shortly afterwards distinct beading of the main retinal artery and vein was seen, and blood flowing towards the optic disc in both arteries and veins. The optic disc was now pale. Respirations continued for a few seconds after the flow was first seen in the vessels. By the time the blood had stopped moving, which was in about one minute, the vessels could with difficulty be distinguished on the optic disc. The media rapidly became blurred.

The explanation of the appearance, in the blood columns, of what has been in this paper described as a granular condition, lies in the slowing of the circulation in the retinal vessels to such an extent as to allow the red blood corpuscles to become visible,

the larger granules being perhaps groups of red corpuscles, the smaller ones single corpuscles. A human red blood corpuscle can be seen under a magnification of twenty diameters. The human *fundus oculi* as seen by the direct method is magnified about twenty diameters. As the normal rate of flow is diminished in the retinal vessels, a stage is reached in which, on close inspection, one becomes sensible of what appears to be a rapid movement taking place in the vessels; as the current becomes still slower the fine and then the coarser granules are seen.

It seems evident that the behaviour of the circulation in the retinal system of blood vessels, after the heart ceases to beat, is such as to cause the blood in the artery to move directly backwards towards the heart and not to pass on through the capillaries into the veins, and that the intraocular tension is an important factor in bringing about this result.

(The experiments on animals were performed in the Pathological Laboratory, Aberdeen University.)

JACQUES LUCCIOLA (Turin). **The Surgical Treatment of Astigmatism.** *Archives d'Ophtalmologie, October*, 1896. (*From the Ophthal. Clinique, Univ. of Turin.*)

Snellen long ago suggested the possibility of a surgical cure for astigmatism, based on the fact already ascertained that the curve of the cornea is affected by all sections of the cornea.

The writer of this article has collected the opinions expressed as to the variations of form of the cornea resulting from such operations.

Donders[1] notes that extraction of cataract forms one of the most frequent causes of astigmatism.

Reuss and Woinow,[2] measuring the corneal curvature before and after cataract extractions, found the astigmatism thus produced to be due to modifications of the curvature of the corneal meridians. They found that, in twenty-one cases out of thirty-one, the axis of the greatest curvature was horizontal, and that of the least vertical; in a solitary case they found the exact reverse; and in nine the principal axes were oblique. According to their researches the more regular the cicatrization the less marked the astigmatism; and further, the astigmatism was less in modified linear extractions than in flap operations.

Weiss[3] found that after cataract operations the curve of the vertical axis decreased, while that of the horizontal increased, and that, generally speaking, the degree of astigmatism gradually diminished after operation. He attributed these modifications of curvature to the forward displacement which the corneal flap undergoes, owing to the intraocular pressure, so that the vertical axis approaches a straight line.

Laqueur[4] found that during the first two weeks following cataract operations an astigmatism of 2 to 7 D. was observable, and that the vertical axis had the least curve in three-quarters of the cases operated on. He noticed that the astigmatism decreased progressively, so that towards the third month it varied between 1 and 2·5 D.

Chibret[5] collects eighty-five cases of operations with the small upper flap with sphincterectomy; he concludes that the corneal astigmatism is more or less pronounced during the first few days after operation, and may rise as high as 16 D.; but it then diminishes progressively for the next six weeks, after which it is rarely modified. In thirteen cases observed long after extraction, all presented an astigmatism

[1] "Anomalies of Accom. and Refraction."
[2] "Ophthal. Studien ü. d. Astig. nach Staar-extractionen," 1869.
[3] *Arch. f. Augen. und Ohrenheilk.*, 1877, p. 58.
[4] *Arch. f. Ophthal.*, Bd. xxx., 1884.
[5] *Bulletins de la Soc. Franç. d'Ophtal.*, p. 66.

of 3 D. He believes the astigmatism is less the further the incision is from the centre of the cornea, and the more regular the cicatrization has been.

Scimemi[1] draws the following conclusions from a large number of cases observed. (1) The forward displacement of the corneal flap does not suffice to explain all the astigmatism produced, as Weiss claims. The principal causal factors of astigmatism are a contraction of the horizontal diameter, and an elongation of the vertical, with displacement of the lip of the flap. These modifications must be due to the action of the recti muscles. When a large corneal incision has been made, the muscle inserted in the sclerotic, near the incision, drags on the scleral lip, while the internal and external recti, not meeting with the customary resistance of the globe, compress the cornea in proportion as the intraocular tension is diminished. (2) The curve of the cornea after extraction does not lose its ellipsoidal form, and meridional sections which pass through the visual line are the most frequently elliptical, as before the operation. (3) In the meridian parallel to the incision, the eccentricity of the corneal ellipse is increased; the angle α diminishes, while still remaining positive (the visual line approaches the centre). (4) In the meridian, perpendicular to the incision, the corneal ellipse becomes less eccentric, the curve becoming almost circular; the angle α is considerably increased and becomes invariably positive (open at the base), while the visual line passes nearly through the centre of the corneal meridian in such a way that the angle α remains nearly equal to zero, and that the summit of the corneal ellipse is placed just below the centre of the meridian.

It will be seen that Scimemi attributes the corneal variations observed after extraction of cataract chiefly to the action of the recti, and especially the internal and external rectus. Leroy, on the other hand, ascertained that the curvature of the normal cornea is that of an elastic sphere, flattened at the equator, very slightly on the temporal side, twice as much vertically above and

[1] *Sull' As. corneale in seguito ad estr. di cat.*, 1888.

below, and four times as much on the nasal side, and that the *minimum* flattening occurs on the temporal side (*i.e.*, the side of the external rectus), and the *maximum* flattening on the nasal side, corresponding to the internal rectus, the former being the weakest and the latter the strongest of the external muscles of the eye. Leroy therefore concludes that these must exercise a definite effect on the shape of the cornea, and this action would undoubtedly become more marked after such an incision of the cornea as the extraction of cataract necessitates. In Lucciola's opinion, all the united forces which, acting on the interior from without, equalise the intraocular pressure, must affect the corneal modifications which we are now considering. Among these forces, the chief is the elasticity of the ocular membranes; then come the external muscles of the eye, whether contracting simultaneously or separately (as in divergence or convergence), and finally the orbicularis palpebrarum.

Jays[1] has shown that the axis of curvature at the meridional section of the eye is proportional to the thickness of the globe at this point, and he explains the astigmatism after operation as follows:—" The mode of formation and the properties of the cicatricial tissues being given, it will be seen that the cicatrization of a corneal wound must result in increased thickness and resistance of the various meridians involved in the wound. A modification of all these meridians at the points where they meet the line of the incision might be predicted, that is to say, the production of a relative hypermetropia in these meridians."

As to the variations of corneal curvature following on iridectomy, especially iridectomy for glaucoma, the writer has ascertained that, in most of these cases, there is a diminution of the curve of the vertical meridian which the incision crosses, and an increase of the horizontal meridian to such a degree that, generally speaking, a direct astigmatism becomes reversed. The degree of astigmatism varies for the first few days after the operation between

[1] Jays, " Essai sur la Mécanique de la Coque oculaire," Paris, 1889.

0·5 and 1·5 D., but it lessens with time, and after three or four months rarely exceeds 0·5 D.

Prof. Reymond has studied experimentally the effects of paracentesis on the curvature of the cornea (" Annotazioni sulla Miopia," 1866). He found that after the escape of the aqueous the refraction of the eye increased, and that this increase was greatest in myopes with a deep anterior chamber, less in hypermetropes, and was nearly always in proportion to the measurable distance between the cornea and the lens. Graefe[1], Manfredi, Albertotti, and Zartuferi[2] and Paci, following up these researches, all found that in eyes with lenses immediately after the escape of the aqueous there is an increase of refraction, which, however, is less than what should occur, owing to the advancement of the lens, and that very probably modifications are produced in the curvature of the lens and of the cornea, sufficient to partially neutralise the increase of refraction due to the forward displacement of the lens. Thanks to Prof. Reymond, Lucciola has also been enabled to collect several observations on this point, whence it appears that, following on the escape of the aqueous, the refraction clearly increases, and in varying degree—most frequently a direct astigmatism of from 0·5 to 3 D. is produced ; the vertical meridian proportionally increases its refractive power, while that of the horizontal meridian diminishes, and during the ophthalmometric examination the catoptric images of the cornea are often seen to change with the modality already observed by Prof. Pierre Baiardi, who writes :—" These ophthalmometric images now separate and now approach one another, showing that the curvature of the corresponding meridian diminishes or increases respectively. Sometimes the images slightly change even their shape, and are arranged one higher than the other ; this indicates that they do not correspond with the principal meridian. It would seem, therefore, that the orientation of the principal meridians of the cornea varies successively. The modifications of the curvature of the

[1] *Centralbl. f. d. Med. Wissensch.*, 1870.

[2] *Giornale della R. Accad. di Med. di Torino*, vol xxix., 577.

cornea appear immediately the patient looks fixedly along the axis of the ophthalmometer. I have also observed that these modifications almost always occur simultaneously with blinking; directly the eye-lashes appear in the field these modifications present themselves, and, to be more precise, if the images correspond to the horizontal meridian they separate, if to the vertical they approach each other. In blinking we should have, therefore, after paracentesis, an increase in the curvature of the vertical meridian, and a decrease in that of the horizontal."

M. Baiardi, in 1892-93, tried the correction of astigmatism by operation in three cases, making small incisions in the *limbus corneæ* with a paracentesis knife; but, not obtaining substantial results, he abandoned the operation. The same treatment was again tried by Straub[1] (1892) and Bates[2] (1894).

Professor Schiess-Gemuseus, in 1894, proposed an operative treatment of keratoconus, and this method, with some modifications, gave good results in five cases in this clinic. The method is as follows:—A small Graefe's knife is entered a few millimetres behind the summit of the cone on the temporal side, the back towards the iris, and is pushed on towards the nasal side in a varying degree, the size of the incision depending on the size of the cone. The knife must be kept in the same plane and withdrawn rapidly, in order to prevent a sudden escape of the aqueous; the summit of the staphyloma is partially or completely divided. A small cicatrix is thus produced which depresses the summit of the cone, and repeating the operation after a few days' interval a central leucoma is obtained, which usually prevents the further bulging of the cornea. This is followed by iridectomy down and in, and the patient obtains relatively good vision.

In the five cases operated on, a diminution of astigmatism of from 3 to 6 D. was obtained (approximately calculated). The operative treatment of astigmatism has been lately

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[1] *Nederland: Tidschrift v. Geneeskunde.*

[2] *Archives of Ophthal.*, 1894, part i.

tried again by Dr. E. Faber,[1] who publishes a case of a young man with myopic astigmatism of 1·5 D., the most refractive axis being 60° to the temporal side. Faber made an incision about 6 mm. in length at the sclero-corneal margin, with a lance-shaped knife, at 60° to the temporal side. A month after the operation the visual acuity was improved by a quarter; the most refractive axis was now 30° from the same side, and the astigmatism was reduced from 1·5 to 0·75 D.

The writer has collected observations on ten cases in Professor Reymond's clinic, of which he gives the results —results which are too recent and too few to be regarded as final.

Generally speaking, it seems that, if the cornea is free from pathological conditions, diminution of astigmatism, following a single incision, seldom exceeds one dioptre. But the patients generally recognise an improvement, a sense of rest and well-being in the eye, in excess of what one might expect from the relatively small improvement in the dioptric condition. It is further noteworthy, that (contrary to what takes place in operations for cataract and iridectomy) in the incisions made for the correction of astigmatism, *when the aqueous is not allowed to escape*, there is generally an increase in the curviture of the meridian in which the incision is made. This is because, in this case, the internal conditions of the eye are almost unchanged; and the modifications which are produced should be attributed exclusively to the formation and properties of the scar tissue. Scleral incisions give a correction slightly higher than corneal incisions, and, generally speaking, the fuller the incision the more perceptible are the modifications of curvature. The mechanism which produces the change in the oblique meridians is not very evident; it seems that, in order to obtain this effect, it might be advisable to make the incision not at the end of the oblique axis, but rather towards the axis which one wishes it to assume.

R. D. Batten.

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[1] *Centralbl. f. prakt. Augenheilk.*, Sept., 1895.

R. GREEFF (Berlin). The Anatomical Basis of Pseudo-Glioma. *Bericht der Ophthal. Gesellschaft, Heidelberg*, 1896.

In examining the collection of specimens at the Berlin Augenklinik, Greeff was struck by the fact that in many cases the anatomical examination failed to confirm the clinical diagnosis of glioma. Such cases, and only such, he includes under the term pseudo-glioma; which hence implies that a mistaken clinical diagnosis has been made. Not that the mistake implies blame, for in certain cases it is not to be avoided. Hirschberg in 1869 thought that no mistake need be made, but this view was soon refuted by Graefe, Schweigger and Leber.

Greeff objects to the extended use of the term pseudo-glioma, especially in England (he says), by which it is made to include all cases presenting a yellow reflex, such for instance as may arise from atypical opacity of the lens after an injury, congenital anomalies — persistent vascular sheath at back of lens, hyaloid artery, connective tissue formations in vitreous, &c. These cases he says need never be confused, by a competent observer, with glioma.

But there remains a certain form of detachment of the retina which calls up in every detail the picture of a true glioma, so that at times one is left in doubt. The anatomical condition in these cases is almost always the same, and depends on a choroidal affection giving rise to an exudation which bulges forwards the retina.

Before describing this condition he details the leading points in reference to gliomata: clinically they are as a rule seen at the "cat's eye" stage, there being a large yellow mass behind the lens, with bossy surface on which are numerous tortuous ectatic blood-vessels. It is quite exceptional to see a gliomatous eye in a state of inflammation or of glaucoma. On cutting into the eye, when freshly removed, somewhat sticky vitreous, otherwise little changed, flows out. The tumour tissue has the appearance of brain tissue, only softer and somewhat granular—like fine millet-porridge. It is not quite uni-

form in structure, and this is more apparent on section, chalky-white spots alternating with grey-white. The former represent patches which have undergone fatty or calcareous degeneration. With hæmatoxylin the fatty matters take on a dark colour; the calcareous matter gives a grating sensation when touched with a needle. Such degeneration is early to appear.

The distinguishing points of a typical pseudo-glioma are as follows. On cutting through the sclerotic a turbid citron-yellow fluid, lying behind the retina, escapes, and in it one sees little glittering particles; these, under the microscope, turn out to be cholesterin crystals; fat granule cells and degenerate pus cells are also thereby revealed. The retina does not collapse when the fluid is evacuated, but retains its bossy form; it appears to be thickened, but closer inspection reveals the fact that in apposition with its outer surface there is a membrane. This is of a dirty yellow colour and can be separated with forceps from the retina; the latter is semi-transparent and only slightly thickened. The yellow pupillary reflex is due to the membrane, not to the retina; the vessels visible ophthalmoscopically are the normal retinal vessels rendered tortuous and ectatic through corrugations in the retina. The yellow masses consist of fatty detritus, more or less fatty pus cells, and numerous heaps of cholesterin crystals. If examined at a late stage, the exudation is found to be organised into firm masses in which many giant cells are found, as has recently been remarked by S. Schultze and Wagenmann. In sections of hardened specimens the retina is found to be degenerated but not much thickened; in one case connective tissue hyperplasia was marked. The primary seat of the affection lies in the choroid, which shows traces of past inflammation, and is almost wholly or in part converted into a connective tissue string.

As the result of spreading irido-choroditis, following upon perforating injuries in the ciliary region, one often finds the same yellow masses in the vitreous chamber, and these (if the history of injury be not borne in mind) could be mistaken for glioma. The yellow appearance

does not proceed from a membrane in the vitreous, but from a subretinal effusion, with fattily degenerated pus cells, just as in pseudo-glioma (Wagenmann).

The ætiology of the choroiditis which is the basis of pseudo-gliomata is diverse. Most frequently it is linked to some general infection—cerebro-spinal meningitis, measles, scarlet-fever, tuberculosis, congenital syphilis; perhaps to be explained by an embolism in one of the choroidal vessels setting up a focal exudation choroiditis, though the proof of this is not forthcoming. In cases reported by Treacher Collins and others, tuberculosis was the cause of the trouble, and this was also probable in one of Greeff's cases. A subretinal cysticercus has produced a picture similar to glioma (A. Graefe). As regards differential diagnosis, it is certain that in many cases it cannot be made ophthalmoscopically. New formed vessels are not always present on the surface of the tumour, and when present may be confused with tortuous ectatic retinal vessels. The tension of the eye is a matter of importance; in glioma it is normal, or at a late stage increased; in pseudo-glioma it is mostly lowered. But Greeff has seen two cases of pseudo-glioma in which the tension was plus. Schöbl has recently collected and described cases of krypto-glioma; this is the opposite of pseudo-glioma, and comprises cases of true glioma in which, however, even an expert clinical observer could not be certain of his diagnosis. Mistakes are even to be made in diagnosing sarcoma of the choroid; thus Greeff has known two cases in which the choroid was bulged forwards as a black swelling, owing to a sub-choroidal exudation, and not to sarcoma.

In doubtful cases we should not hesitate to practise excision, but before doing so fresh light may be thrown on the case by an exploratory scleral puncture and the withdrawal of a small portion of the contents of the eye; it can then be quickly decided whether we have to do with a sarcoma, a glioma, or an exudation. But such a puncture is not without some risk, as it may entail local recurrence later on.

W. Watson Griffin.

M. BONDI (Vienna). Pathological Changes in the Retina in cases of Pernicious Anæmia. *Archiv f. Augenheilk., November*, 1896.

This article deals with the microscopical changes found in pernicious anæmia, and is based on the examination of six eyes taken from four subjects of the disease, and on a comparison of the author's results with those of his predecessors in the same field. Of these latter, those who have based their opinions on anatomical examination are: Manz (one case), Uhthoff (four cases, six eyes), Litten (one case), Bettmann (two cases, four eyes), and Natanson (two cases).

Of Bondi's own cases, one was the subject of mitral disease and chronic granular kidney, as well as pernicious anæmia. The other three died of uncomplicated pernicious anæmia. The changes found in the first case, however, were so similar to those in the other three that the author considers himself justified in including it in his series. The changes discussed are (1) the retinal hæmorrhages, (2) the white spots in the middle of the hæmorrhages, or apart from them, (3) the changes in the vessel walls, and (4) the occurrence of retinitis and papillitis.

With regard to the first point, there is a general agreement that retinal hæmorrhages are all but universal in this disease. Uhthoff finds them mostly in the nerve-fibre layer, less often in the outer molecular layer, and occasionally in the two granular layers; they need not necessarily be confined to a single layer. Bondi confirms Uhthoff's statement, and says that their size may vary from the minutest possible to a diameter greater than that of the optic disc. He claims to have found the largest on record, namely, one measuring about three discs in diameter. In another of his cases the membrana limitans externa was ruptured, and blood was found between the rods and cones.

Concerning the second point, there are different views as to the interpretation of the white spots which are found in the middle of the hæmorrhages. Manz, in his case, found

them to be enclosed by a definite membrane of considerable thickness, and to consist of small round cells, generally nucleated but sometimes enclosing only granular matter. Uhthoff, in four of his eyes, found varicose hypertrophy of the nerve-fibres in the innermost layer of the retina, forming objects of considerable size, generally isolated but sometimes surrounded by blood. To these he attributed some, at any rate, of the white spots ophthalmoscopically observed. Besides these he found shining colloid or finely granular masses of variable size and form in the outer molecular layer. Bettmann found the varicose hypertrophy of the nerve-fibres described by Uhthoff, and also collections of lymphoid cells in the midst of hæmorrhages, and ascribes the white spots to both these origins. Bondi himself found varicose degeneration of the nerve-fibres, and, in three of his four cases what he calls "ganglionic" degeneration of the nerve-fibres—"circumscribed collections of cell-like structures, in many places being visibly in connection with nerve-fibres and showing a nucleus of variable size staining deeply with eosin." These "cell-nests" were found to project both inwards towards the vitreous, and outwards, compressing the inner granular layer. The largest of them measured 0·4 mm. by 0·26 mm., and was situated near the papilla. Many of them were in the situation of large hæmorrhages proceeding from vessels of middle size. As to the other hæmorrhages, Bondi found in some of them, but not in all, a white centre, and concludes on this subject: "The bright points in the centre of hæmorrhages described by many authors are caused partly by varicose or ganglionic degeneration of nerve-fibres, partly by spheroidal structures apparently originating from the vessels and consisting of clear clot."

As to the third point, Manz described capillary aneurisms as occurring in his case, but his observation, though supported by one clinical observer, has not been confirmed by other pathologists. On the other hand Bondi, following Bettmann, lays great stress on disease in the walls of the middle and smaller vessels. "The vessel-wall is thickened, the lumen narrowed; there is proliferation of epithelium

and collections of round cells in the walls." On this point he is at issue with other observers (Ulrich, Natanson) who have found no such changes. Finally, with regard to papillitis and retinitis, only one of these observers (Litten) has related a case in which these conditions were found *post-mortem*. Considering the small number of the cases yet examined this circumstance cannot throw doubt on the diagnosis of a condition which is admittedly rare in this disease. [One case in which "well-marked optic neuritis" was observed is related by Dr. Stephen Mackenzie in the *Lancet* of December 7, 1878.] Bondi is of opinion, however, that the term "hæmorrhagic retinitis," as applied to these cases, is a misnomer.

A. H. Thompson.

Grandclément (Lyons). Inflammation of the Uveal Tissue of the Iris. *Archives d'Ophtalmologie, October*, 1896.

Histology and embryology have taught us that of the four layers which together compose what we call the iris, the three anterior strata arise from, and are continuous with, the vascular tissue of the posterior portion of the globe, viz., the choroid coat; these are, the endothelium most anteriorly, the parenchymatous tissue or iris proper, and the fibrous limiting membrane; while the fourth, the most posterior of all, the posterior epithelial layer, is an outgrowth, or, so to speak, a prolongation anteriorly of the nervous tissue or retina, reduced after passing the region of the ora serrata to its most external stratum, viz., the pigmented epithelial layer with the addition of a few elements of the special connective tissue.

When inflammation attacks all these layers, or those three which lie anterior, we have the development of an iritis, properly so called. But inflammation may attack, and sometimes does attack, only the posterior layer of the iris, and remains limited to it, giving rise to symptoms quite distinct from those of iritis. It is this disease of

which Grandclément treats, which he claims to have been the first to describe (in 1891), which he asserts to be as distinct from iritis as pleurisy is from pneumonia, and for which he suggests the name of "Uvéite Irienne," or, "Iritis uvéenne."

Contrasting iritis proper with iridic uveitis, as we might translate the name, the author says—making the most, however, of his comparison—iritis betrays itself by violent and emphatic symptoms, by reddening of the eye, by intense photophobia, by alteration in the colour of the iris, which becomes of a "dirty" hue, sometimes by hypopyon, by severe ciliary pain, by sudden and considerable interference with vision; these symptoms last at least twenty or thirty days, much longer if treatment is not prompt and skilful; the disease usually attacks one eye, and is more frequent in men than in women.

Iridic uveitis, on the other hand, only reveals itself by symptoms which are little obvious, made out with difficulty, and which, indeed, may be latent in some degree; there is very slight congestion of the eye, little interference with vision, no change in the tint of the iris, no pains in the head, a little tenderness of the eye on pressure and on (exaggerated) movements; these symptoms last five or six days, coming and going alternately in the two eyes, and occur more frequently in women than in men, and chiefly during the middle period of life, viz., from the ages of 17 to 50.

As to etiology, iritis always points to a precise and quite manifest cause (?), which is most frequently syphilis, but may be rheumatism, gout, diabetes, gonorrhœa, &c. Uveitis, on the contrary, is associated with none of those marked diathetic conditions, occurs, as has just been mentioned, most frequently among women, and those pure of life and regular in habits, and is not accompanied by any local or general malady which is capable of explaining such a lesion. And in regard to treatment, also, there is a distinct contrast. Iritis demands the use of atropine locally, associated with the general or internal treatment best suited to its particular etiology,

whether that be syphilis, gout, or what not; and, as a rule, the cure is complete and lasting. But uveitis resists all the various modes of treatment applicable to iritis; resists even subconjunctival injections of corrosive sublimate—a mode of treatment which, in Grandclément's opinion, has shown itself of great value in obstinate and intractable cases of iritis and irido-choroiditis. Uveitis, he says, recognises only one master, but that master is unfailing—namely, iridectomy. When once the diagnosis is made, iridectomy should at once be performed.

In conclusion, the author mentions that the same disease is met with in horses, who suffer sometimes from "periodic fluxion," this taking the form either of "inflammatory fluxion" (rheumatic iritis) or "dry fluxion" (uveitis). He gives a detailed account of three of his own cases occurring in women, of which the main facts are as follows:—

Case 1 was that of a lady, aged 37. In the family history the only point of importance was, that the patient's father became blind from a progressive disease of the eyes of unknown character. The patient's own symptoms had begun at the age of 29, and had at first consisted of muscæ, generally dark, but rarely coloured, floating before the two eyes alternately. The attacks in each eye lasted about five or six days at a time, and were accompanied by slight injection of the globe and transitory disturbance of vision. The periods of freedom lasted several weeks or even months; the crises were more frequent and more severe in the right eye than in the left, and had left it permanently damaged; there were some adhesions to the capsule of the lens. At the time of operation the right eye had become quite blind by a recent attack; the fundus could not be illuminated; the left eye presented some posterior synechiæ, but the media were clear and vision was good. Double iridectomy was performed, with the result that not only were there no more attacks in the left eye, but the worse one obtained vision of one-fifth.

Case 2 was that of a woman who at the age of 25 began to suffer from "periodic dry fluxion." There was redness and tenderness of the eye lasting a few days at a time and

recurring at intervals. Double iridectomy was followed by good results.

Case 3 was that of a man who began to suffer when about 26 years of age, and who was also cured by iridectomy. The main features of the case were similar to those of Case 2.

[Do these cases essentially differ from the somewhat familiar ones of recurrent painless and almost non-adhesive iritis and cyclitis occurring in anæmic women ?]

W. G. Sym.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

E. Nettleship, F.R.C.S., President, in the Chair.

Thursday, December 10, 1896.

Clinical Evening.

Superficial Choroido-retinitis of Peculiar Form and Doubtful Causation.—This case was shown by Messrs. Holthouse and Batten. The patient, a young woman, aged 25, was first seen in October, 1896, and gave a history of slight dimness of sight of five weeks' duration. On examination, the fundus oculi showed widespread superficial choroiditis of a peculiar kind, there being numerous white rounded patches, very closely scattered over the whole central region, including the maculæ, some of them very minute, others about the diameter of a retinal vessel. In many places several spots had coalesced forming larger areas. There was no pigmentation around them. Vision was $\frac{6}{9}$ in each eye. There was no appearance nor history of syphilis, congenital or acquired. She presented symptoms of masked Graves' disease. She was the youngest living of twenty-four children, twenty of whom died in infancy of some obscure cerebral disease. There had been no consanguinity of parents, but the case suggested some nervous affection like retinitis pigmentosa. The condition had undergone no change up to the present time.

Dr. James Taylor said, on the question of inheritance, that the girl was the offspring of a very prolific marriage; it was remarkable that in Friedreich's disease, and he believed also in Leber's disease, there was frequently a history of prolific marriages.

Sudden Failure of Vision in both eyes with total Obscuration of Fundi in a Young Healthy Man.—This case was shown by Dr. Batten. A man, aged 26, was engaged in mowing hay in July, when he was seized with sudden giddiness and failure of vision. When seen two weeks later he had perception of light only; the pupils were equal and active to light. In the right eye no view of the fundus could be obtained; there was a grey reflex only. In the left there was also much haze of vitreous; some white patches could be seen in the fundus, but not definitely located. At the present time in the right there was a large white patch in the macular region, and other patches in the periphery, probably choroidal; in the left some white patches could also be seen. There was no history nor appearance of syphilis; he was a robust healthy man; he had had no bleeding in other organs. The cause was probably a hæmorrhage brought on by stooping.

The President thought the case probably belonged to the group of large spontaneous hæmorrhages occurring in young adults, one feature of which was their liability to recur.

Mr. Gunn thought the changes in the macular region were suggestive of deep retinitis of renal origin.

Melanotic Sarcoma of Orbit.—Mr. Richard Williams read notes of this case and showed microscopic specimens of the tumour. The patient, a female, aged 40, had had her eye removed four or five years ago for the results of iridocyclitis. No examination of the globe had been made. In August, 1896, the glass eye which the patient wore became displaced and appeared to squint inwards. On examination a soft growth was found in the orbit, which on removal proved to be a melanotic spindle-celled sarcoma.

Essential Shrinking of the Conjunctiva with Bacteriological Examination.—This case was shown by Mr. A. Quarry Silcock. A girl, aged 8, was admitted to Moorfields

Hospital on November 13, 1895. On examination under an anæsthetic, the conjunctiva was found to be extremely hyperæmic and generally œdematous; moist flattened papillary growths projected from the tarsi of both upper and lower lids; the right cornea was clear, the left infiltrated. There were sores and scabs about the anterior nares, and it was supposed that these had been the source of contagion for the eye. The left cornea perforated, and the eye was excised. On March 24, 1896, the patient was re-admitted. There was much thickening and shrinking of the right conjunctiva; the lashes were inverted; there was some ulceration of the cornea, with infiltration and a yellow slough which re-formed when removed. Early in May there was some obstruction to the air passages, and the patient coughed up a large hard mass of membranous exudation. By June 6 the left socket had become obliterated; the right cornea was opaque. The aim of treatment had been to disinfect the conjunctival sac, but it had not succeeded. At the present time the left socket is completely shrunken, and there is only a narrow opening between the lids; the right cornea is opaque, the conjunctiva contracted, and the V. = p. l. The case had been examined bacteriologically by Mr. Plimmer.

Mr. Plimmer said that the bacteriology of pemphigus was scattered but uniform; the same organism has been repeatedly found. The one gap in the chain was owing to the impossibility of making the organism grow on any animal's skin. The organism was a micrococcus which grew in pairs; it grew in serum or glycerine agar at incubator temperature. He had injected some of the fluid from one of the blisters on the skin in this case into the peritoneum of a mouse, which died of acute septicæmia; a guinea-pig died forty-eight hours after it was injected into the pleural cavity. A small drop was inserted into a rabbit's eye; after two days there was intense inflammation and discharge and the eye was more rapidly destroyed than with other septic organisms. The suppuration was not produced by a strepto- or staphylococcus, nor by any skin organism. It was identical with that which had been already found by other observers.

Mr. Malcolm Morris said that there was the greatest controversy now going on as to the nature of the diseases producing bullæ. The cases in which the eye was involved differed from true pemphigus, so that it was not at all easy to be sure of the nature of this affection. He did not think it was a true pemphigus.

Retinal Detachment of Obscure Origin.—This case was shown by Mr. Silcock. The patient was a boy, aged 10. When first seen early this year there was a localised detachment of the retina just outside the yellow spot, which steadily enlarged till August. Under an anæsthetic he punctured the swelling through the sclerotic at its summit, with the help of the ophthalmoscope; a choroidal reflex was seen through the rent so produced, and much fluid escaped. The rent closed, the fluid was re-formed, and some separate areas of choroidal exudation were now seen. The eye was said to have been always defective. There was no history of injury.

Mr. Lawford had had a case recently in a healthy boy aged 14, in which there was a large detachment of the retina of obscure origin; he had punctured it and let out serous fluid, but without result as regards the detachment.

The President suggested retinitis proliferans as the probable nature of the affection.

Mr. Silcock said that retinitis proliferans had been suggested by Mr. Holmes Spicer, who had first seen the case.

Mr. Holmes Spicer said the case presented many of the characters of retinitis proliferans, but the main central part of the attachment was very prominent and rounded; he thought the detachment might be caused by a cysticercus.

Epithelioma of Cornea and Conjunctiva.—Mr. Lang showed this case, occurring in a man. The growth was a raised whitish vascular mass, about the size of half an almond, situated at the nasal border of the cornea. Its duration was uncertain.

Mr. Marshall said that the microscopical examination of a small portion showed merely heaped-up masses of epithelium, partially degenerate, but no cell nests were discoverable.

Coloboma of Lens.—Dr. A. Bronner exhibited a drawing of an eye with an upward and outward coloboma of the crystalline lens. There was partial atrophy of the iris in the corresponding position. No sign of the suspensory ligament could be seen in the coloboma.

Embolism of the lower Main Division of the Central Retinal Artery.—Mr. Lawford showed this case in a healthy man, aged 37. The case was peculiar, in that when first seen, five days after the failure of vision, there was very gross defect in the *lower* half of the field of vision (as well as loss of the upper half), although the upper portion of the retina and its vessels showed no ophthalmoscopic changes. A month later the lower half of the field was of normal contour.

Improved Style for Nasal Duct Obstruction.—Mr. Bickerton showed and described this instrument, which was a combined nasal style and probe. The style was a hollow one; the probe could be first inserted and the style threaded over it. A short horizontal limb of the style lay in the slit canaliculus and was scarcely visible.

Mr. Anderson Critchett said hollow styles were in use many years ago. He thought styles which were to be worn permanently should be gilt, as the secretions reacted upon silver.

Mr. Priestley Smith spoke in favour of solid silver styles.

Pigmented Growth of Conjunctiva.—Mr. Doyne showed a patient, aged 45, with a pigmented growth of the upper palpebral conjunctiva. Some months ago he removed a fleshy granulation from the inner canthus and neighbouring conjunctivæ. This was followed by pigmentation of the conjunctiva at the site of the growth, and on the surface of the upper lid. The pigmentation had since then gradually disappeared.

Ulcer of Cornea treated by Oxygen Gas.—Mr. Treacher Collins showed this case. A man, aged 62, had severe hypopyon ulcer of cornea, after injury. After three weeks treatment by oxygen gas the ulcer was completely healed.

Dr. George Stoker showed the apparatus, and described the method adopted in its employment.